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The Dealer's Place in the Present Development of Distribution

By John D. Nicklis

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THE years 1925 and 1926 were periods of unusual development in business. Practices and methods that had stood for generations were found inadequate in the present scheme, and some of the newer innovations have not yet had sufficient use to make it safe for any one to say whether or not they are practical and better than those that have been scrapped. Into that phase of the industrial program that is represented by the dealer, or distributor of supplies, there has come a situation that merits the careful study and close attention of executives whose task it is to keep factory wheels in motion and to give special attention to the keeping down of costs. There has been, and it is still in motion, an attempt on the part of many buyers of shop supplies and miscellaneous equipment to do away with the dealer or distributor—the middleman, as some would call him. In our industry the dealer is in no sense a middleman. It is this situation that we are going to discuss here.

It might be well first to look into the reasons for this attempt. It is the complaint of some large manufacturers that the dealer's price for ordinary shop supplies is too high. The manufacturer objects to paying a price in advance of the factory list and believes that the dealer is an unnecessary evil in the chain between the source of supply and the consumer. He would prefer, so he thinks, to buy his materials direct from the manufacturer, save the dealer's profit and so reduce his own overhead. This, of course, is an old story; but during tne past year it has become increasingly important because of the almost universal adoption of hand-to-mouth buying all over the country.

We have been told by many economists that hand-to-mouth buying is practical, is wise, and generally economical. In a world of constantly changing ideas and methods of manufacture, when market conditions are so often affected by seemingly unimportant happenings in financial and industrial circles, the system of buying according to needs would seem to be quite sensible. I firmly believe that it is the only way to buy certain commodities, and, while it does breed certain evils, it is freer from error than any other system we have tried. I could go on defending this method, but that is not the main purpose of this article. The supply business has suffered greatly in the past year from the competition of the fly-by-night dealer who carries his office in his hat and who, by reason of this low overhead, can afford to undersell the legitimate dealer who provides quality merchandise, service, quick delivery and the assurance of fair dealing with a house that has a reputation to uphold and a future to build on the basis of square dealing with satisfied customers.

> Price cutting is the result of unfair competition, but it can be curbed by allowing the legitimate dealer, the dealer who serves, a fair margin of profit and by eliminating that class of dealer who guarantees nothing and furnishes little more

The result is an orgy of price cutting which benefits no one, is working a hardship on the dealer and leading the consumer nowhere. Present prices are inadequate to make business in some supply lines profitable for the dealer who has a high sales expense. And this dealer is beginning to weed out his stocks and to carry only those supplies on which he can make a profit commensurate with his investment and effort. Lines that are kicked around among nondescript dealers are the ones that will eventually be without any kind of representation, and then the buyer will discover how difficult and expensive it is to get them "direct from manufacturers."

Take the case of the small tools used in every machine shop. A manufacturer needs a certain number of taps, dies, hacksaw blades and files to complete his equipment for a certain rush job. He goes to the dealer in his territory and gets them without trouble, without delay, and at a fair price.

Suppose he had to send to four different manufacturers in four different localities, wait for four different railroads to deliver them—and in the end he will pay only a little less than the price he would have paid to a dealer. Is that slightly lower price worth the delay and inconvenience? According to modern, highly efficient production methods, is it economical?

The diversified and complete line of mechanical goods cataloged by a dealer makes it possible to purchase a large assortment of miscellaneous items from one central source. Group buying is recognized as the modern, efficient and economical buying method because it saves labor and expense within the buyer's organization—in reducing clerical outlay and accounting. In group purchasing there is also a decided saving in packing and shipping charges, over miscellaneous buying from a number of different sources. The labor of "following up the order" is greatly reduced and the chance of mis-shipment eliminated. Unpacking expense is lessened and checking in the receiving department expedited.

Forcing Standardization

Hand-to-mouth buying is forcing standardization upon the dealer. Instead of carrying a multitude of sizes, types and styles of tools and shop supplies, the dealer is concentrating on those articles that are in more general use and, therefore, in greater demand. Restriction of lines carried by dealers to those that offer the quickest turnover and greatest margin of profit is something that shop executives and purchasing agents must consider. It will have a far-reaching effect on their businesses.

Hand-to-mouth buying is misnamed. It is an economical system, because it permits of closer estimating on specifications for special work. It eliminates large inventories and it relieves the purchasing department of the danger of overbuying of supplies in quantities based on past consumption. Why should a manufacturer buy more than ordinary requirements when so many unforeseen things can enter into a business and affect its efficient and profitable conduct?

A Useful Medium

All this serves to emphasize the increasing usefulness of the dealer. He takes all the chances, as it were, in carrying large and diversified stocks of merchandise, relieving the consumer of the necessity of tying up capital in large quantities of supplies. The dealer is usually centrally located in a large industrial district, and he covers a wide territory with a frequency that is a great advantage to the buyer of his stocks. He can make quick deliveries, and this is one of the most powerful arguments in favor of his existence. He is familiar with the financial stability of the buyers in his territory, and this saves the manufacturer of supplies the trouble and expense of maintaining large credit facilities.

There are many other factors which enter into this discussion, but it is the general conclusion that hand-to-mouth buying and the dealer go hand in hand in the present scheme of distribution. One is as important and as necessary as the other, although it cannot be said that one can get along without the other. Each is a practical and an economical factor that must be accepted as fitting into the industrial development of the country.

Manufacturers who use supplies carried by the dealer must realize the economy of the system and should assist the dealer in his effort to give better merchandise, better service and better prices. The last is the present bone of contention, but it can easily be settled by assuring the legitimate dealer his proper place in the present industrial program.

Price cutting is the result of unfair competition, but it can be curbed by allowing the dealer a fair margin of profit, and by eliminating that class of dealer who guarantees nothing and furnishes little more.

Musings of An Old Timer

Plenty of good news for machinists.

The world could not long endure without machinery.

Therefore you chaps who build machinery have a man's job.

To keep the world from freezing and starving to death, or standing still.

Our work then is quite as important as that of any other man.

For no other trade or profession has greater power or influence over the whole civilized world.

It is indeed a princely power, so let's make the most of it.

But also, hear some sour pickled news, so you won't get swelled up after reading the above.

There was a bull made this morning on boring out a big pulley for Briggs' mill.

Now Briggs is one of our best customers and he was quite hot about the delay.

About forty of Briggs' men had to lay off and lose a day's pay. And Briggs lost production in one department for a whole day.

There was a slip along the line—Joe Brown, who bored the job, explained that he had set his caliper to the wrong measurement.

The error all told cost around five hundred dollars. Some error.

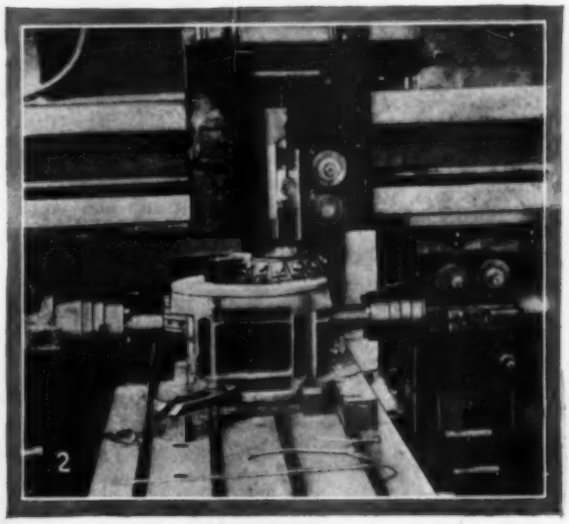
Briggs' mill makes flour by machinery and sells it to bake shops that make bread by machinery; and our error in this instance helped to set the world back and was, as you see, a serious matter.

Also, we are apt to lose some valuable patronage and we might all have to walk the plank if this continues.

So be careful, boys and "kodak" as you go.

Some Milling, Turning and Burnishing Jobs *in a Railroad Shop*

These methods are used by the Oregon & Washington Railroad, division of the Union Pacific System at the Albina, Oregon, Shops



Figs. 1 and 2—Milling shoe and wedge liners and lateral wear plates in driving boxes on a Newton planer-type milling machine, using three spindles. Sixteen boxes are set up and milled in eight hours

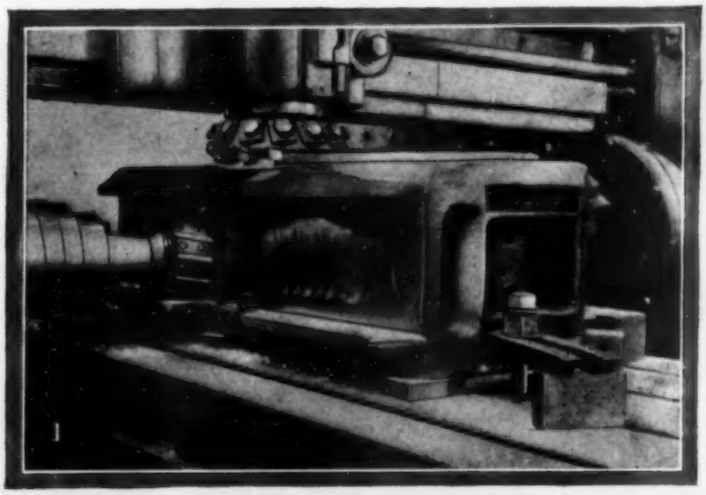
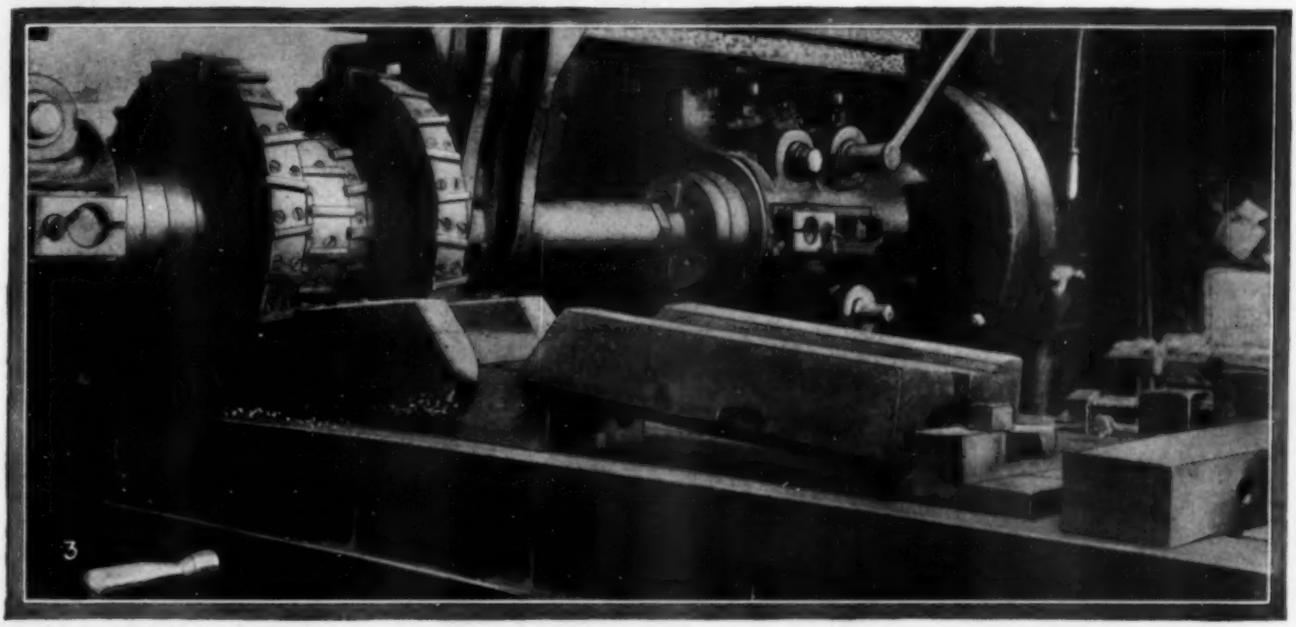


Fig. 3—Milling driving-box wedges on the same machine. The straddle mills have inserted blades and are 16 in. in diameter. The interlocking side and face mills for milling the channels are of proportionate diameter. Two sizes of separator blocks are used, to allow for the taper; the ends of the wedges enter dovetails of the larger blocks, and tongues, of the smaller blocks enter slots of the wedges. Twenty wedges are set up and machined in eight hours. When shoes are milled, only the larger separators are used, and a long bolt, extending through all of the blocks, holds them together



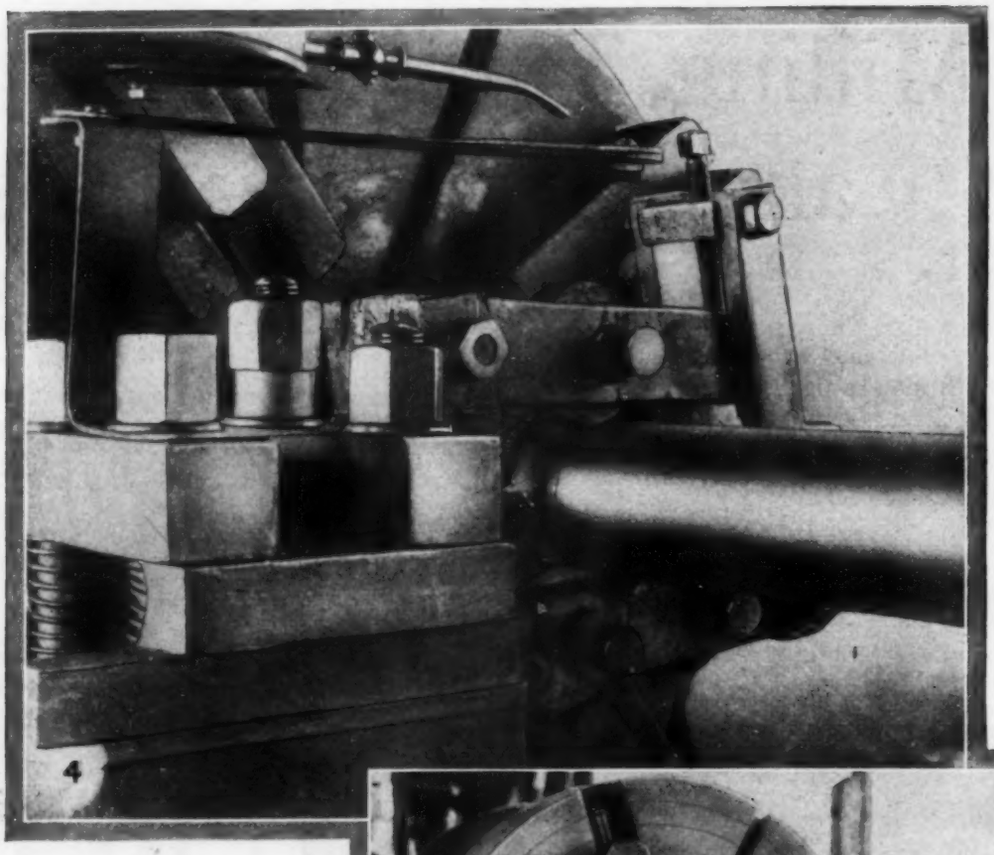


Fig. 4—Piston rods are burnished by the three-roller tool shown. The operation is begun at the crosshead end, which is relieved at the keyway. The rod is ground-in to the crosshead

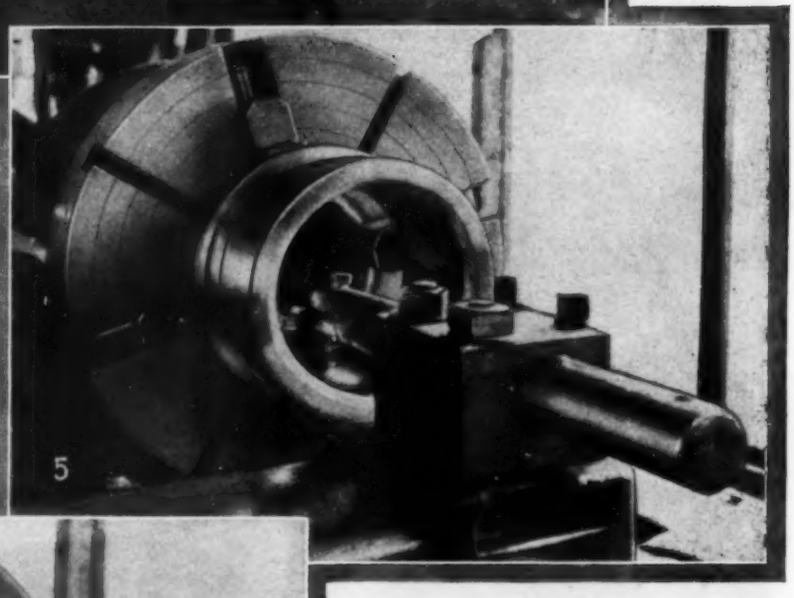


Fig. 5—Burnishing the inside of a floating bushing for a solid-end main rod with a solid tool

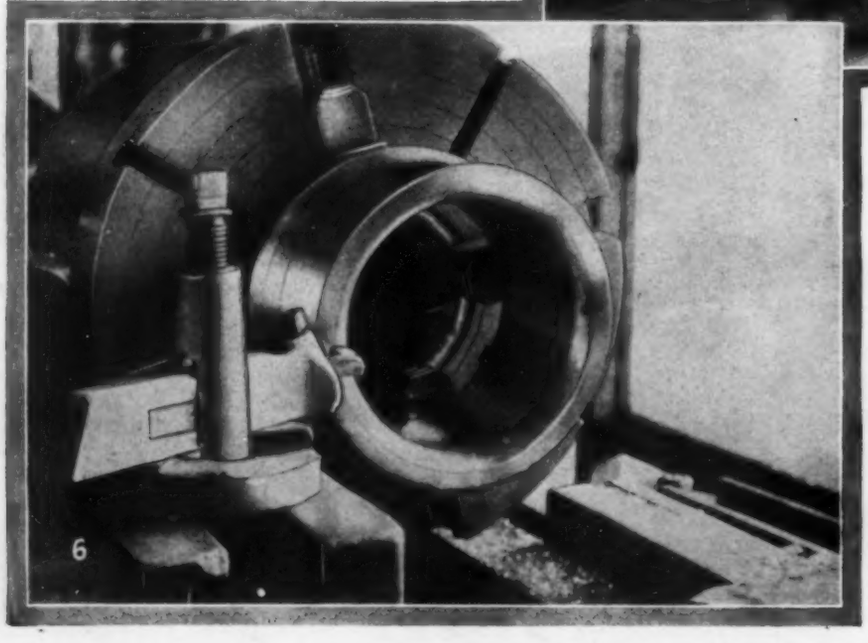


Fig. 6—Burnishing the outside of a floating bushing for a solid-end main rod with a solid tool

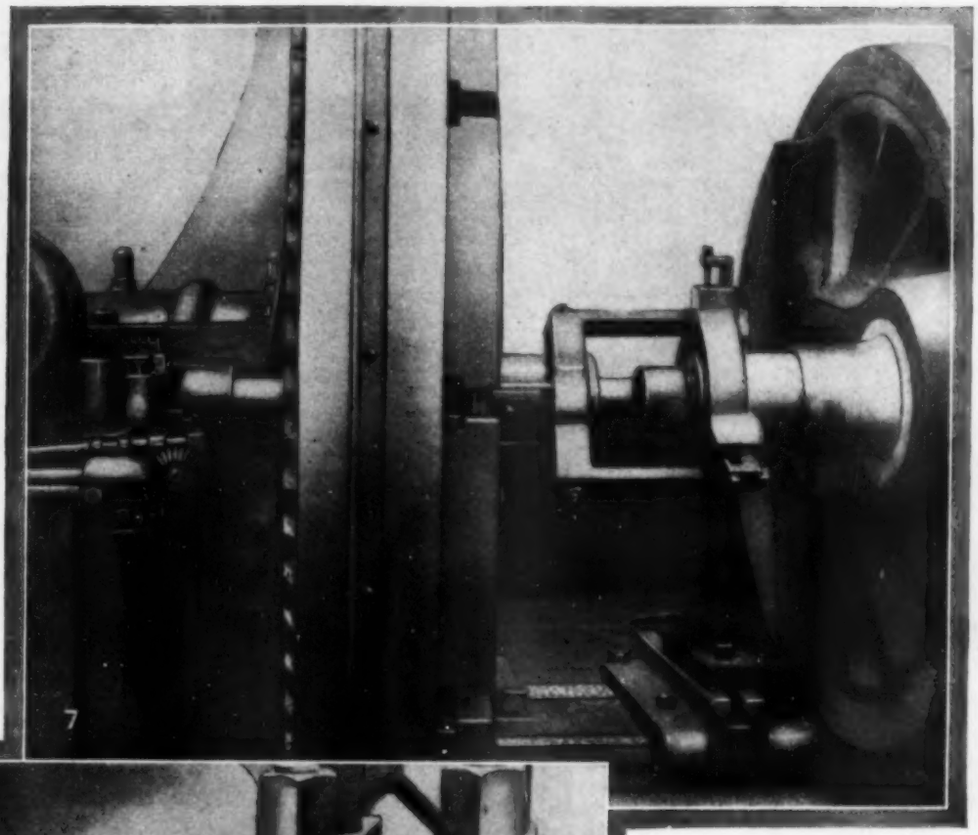


Fig. 7—Burnishing a crankpin in a Niles-Bement-Pond journal-turning and quartering machine

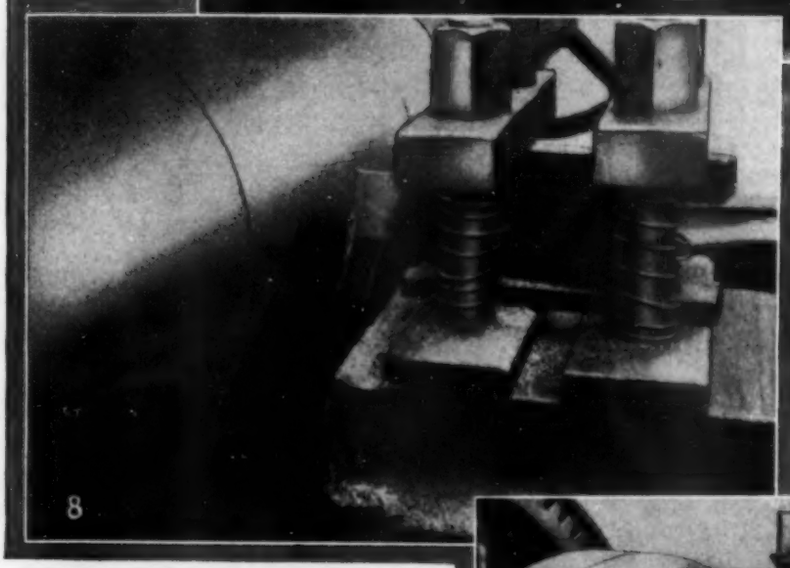


Fig. 8—A shearing tool is used in finishing carbon-vanadium booster axles

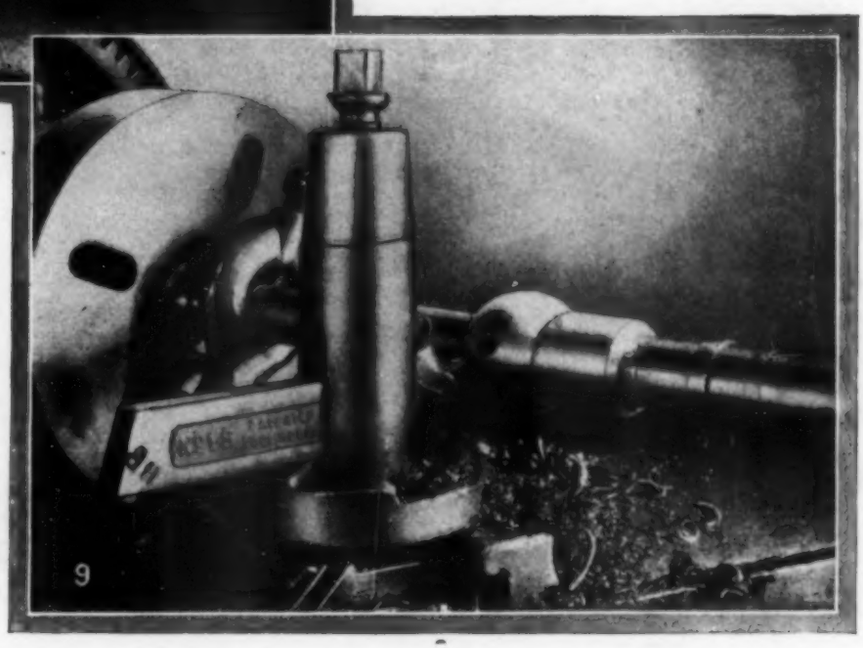


Fig. 9—Turning ball joints for superheater header units. The compound rest is set with the center about which it rotates coinciding with the vertical projection of the center of the ball of the joint. By means of a suitable lever attached to the compound rest, and moved by hand, the tool is caused to travel in the required circular path

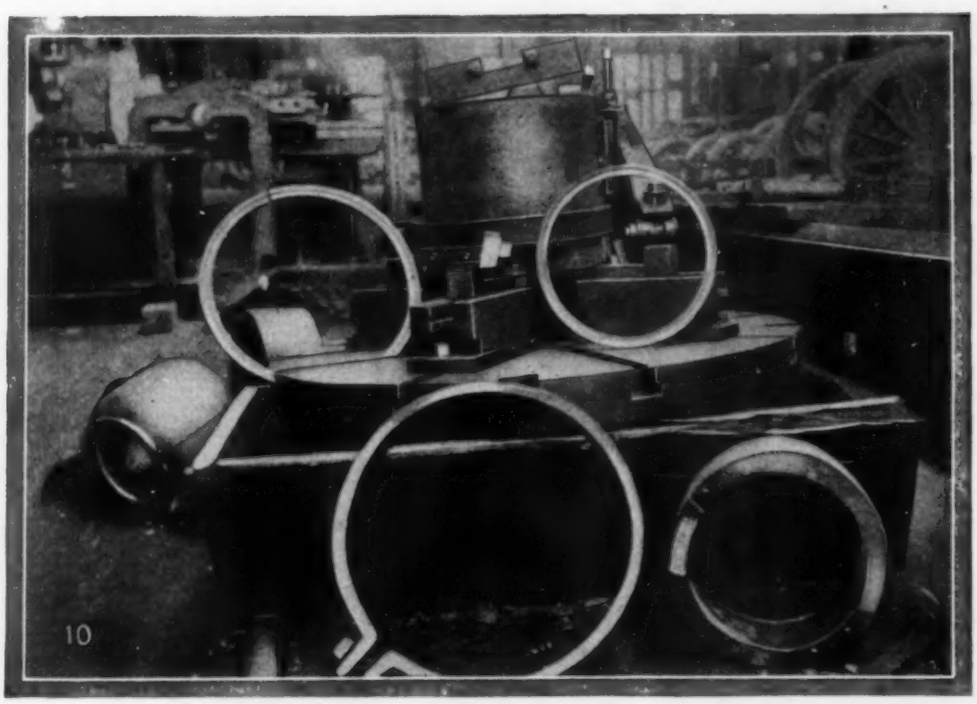


Fig. 10—Remains of a ring pot, sample rings, and the compressing clamp used in pulling the pot together to close the 3/8-in. slot, while it is being chucked in the vertical turret lathe preparatory to machining and cutting-off

Fig. 12—The set-up for machining valve rings on a Bullard vertical turret lathe. The pot is split before turning and boring. A circular form tool, of L shape, held in the side head, is used in facing the side of the ring that is the top of the pot before being cut off. The cutting-off tools, held in the turret, are run down to straddle the side of the pot, and then fed in and out

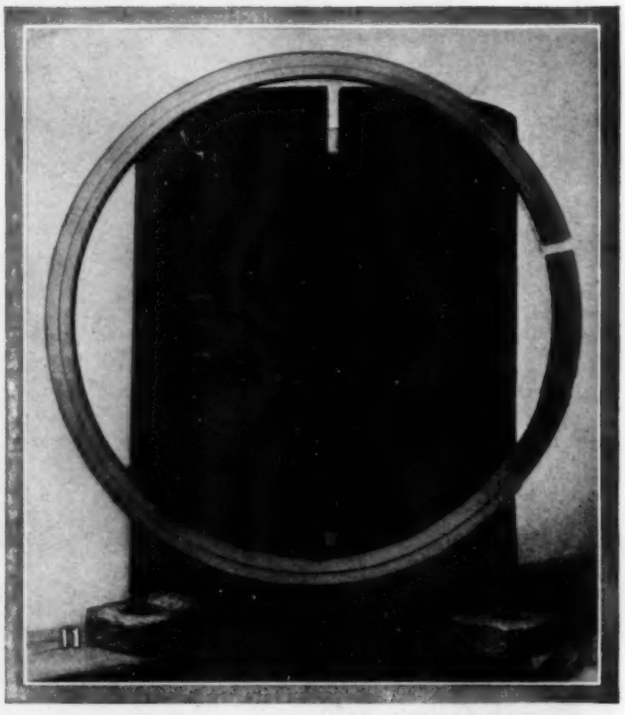
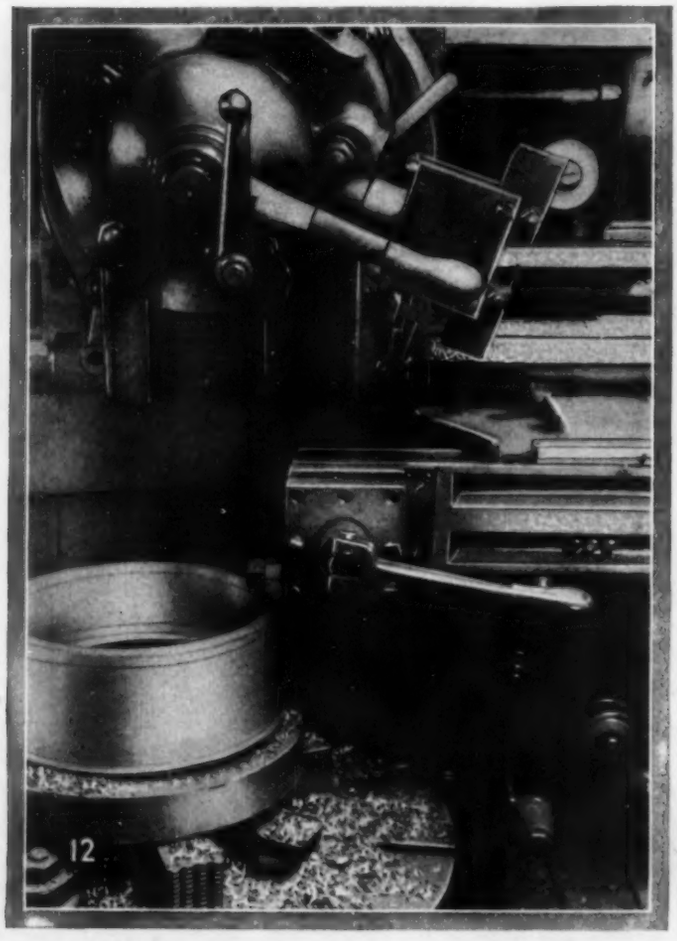


Fig. 11—A finished, split valve-ring, and a pot casting of the kind from which it was made. Standard ring sizes are maintained; worn bushings are discarded



Machine-Tool Lubricating Systems

"Who Should Keep Machines Oiled?"

By E. P. BLANCHARD

Advertising and Assistant Sales Manager, The Bullard Machine Tool Co.

THERE appeared in late issues of the *American Machinist* an editorial, "Positive Lubrication Needed," also numerous suggestions as to "who should keep machines oiled." It seems that while machines have been designed and built to undertake the burdensome and exacting tasks of direct production, too often those indirect but very necessary tasks that contribute to productive ability seem to have been slighted.

Too often and too many are those odd places for oil where "it won't take so long—just once a day or so" which keep the operator from specializing on production. The half-way job of connecting a few neighborly bearings to one oiling point is only a guilty apology for an admitted error. They still take time and attention. They still require a good memory and a reminder of when to remember.

The man on a modern machine equipped with automatic lubrication is as complacent as would have been a Connecticut Yankee with a six-shooter among the spears and shields of King Arthur's Court as he watches the gang on older machines approach the job each morning with oil cans unsheathed, lubrication chart over the left arm and hip pockets bulging with waste to absorb the oil that never gets there anyhow.

The latest evidence, however, fails to show that all modern machines are automatically lubricated. A select few of the builders were using splash systems in 1900 and later, by 1910, one builder had definitely stepped out of line and was including a constant flow lubricating system in his designs. Since then, except for the few wise ones who anticipated the positive need of oil, there has been mostly makeshift and apology. Some twenty years experience with a system built into hundreds of tools has indicated certain essential features—the ultimate objective being an ample supply of clean pure oil properly directed to each point where friction occurs. A satisfactory means of accomplishing this method of lubrication comprises a central oil reservoir, a pump driven at constant speed from a prime mover, an oil filter and a distributing system with visual check on the flow of oil leading to all units in the machine, as shown in Fig. 1. The central reservoir should be of sufficient capacity to avoid too frequent renewal of the main supply. This job can then be made periodical with a calendar tickler that is part of the general scheme of equipment supervision. This body of oil is, therefore, large enough to maintain reasonably low working temperature even under severe service, and is placid enough to permit the precipitation of any foreign matter carried down from the operating parts.

The oil pump connected to the prime driver assures continuous functioning of the system so long as the machine is in operation, and constant speed is necessary that the flow of oil may not vary. Filtering signifies the removal of all solid matter that might accumulate and clog the passages, and it implies the certain elimination of such sizable particles as might cause excessive wear or scoring of bearings. The oil from which has been deposited all heavier matter in the sump, and that has then passed through an effective filter, is ready for re-circulation. Facilities for filtering, however, must offer no obstruction to an adequate flow in the system at all times.

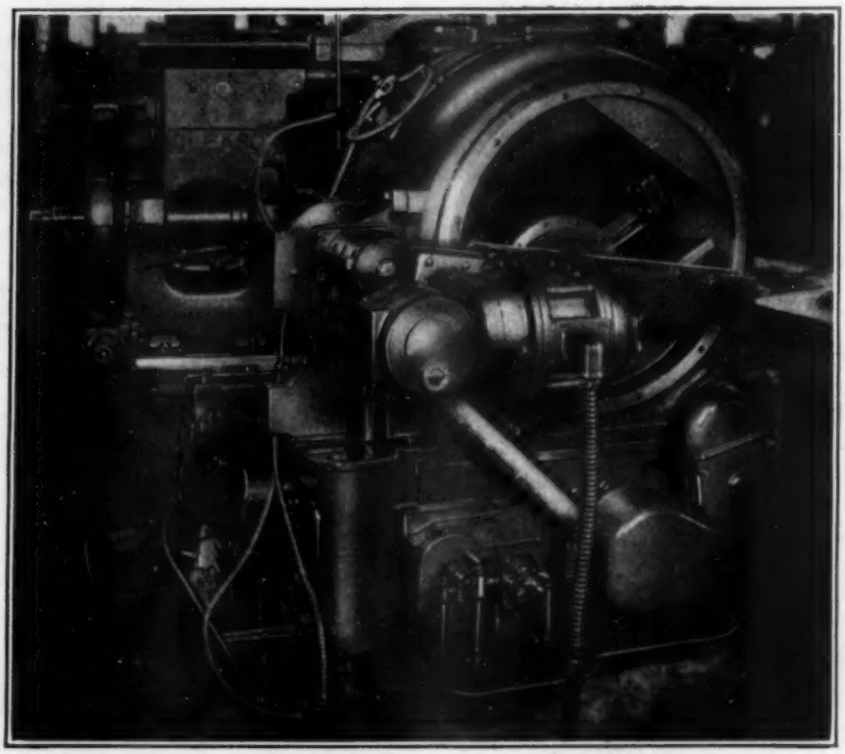


Fig. 1—Machine equipped with an oil pump, a sight-feed gage and a filter in the base

Distribution by separate ducts, as shown in Fig. 2, leading

to the several operating units of the machine properly directs the flow where it is needed, and the insertion of a gage in each duct provides visual evidence of constant flow at all times. It is even possible to so design the gage that any clogging of the duct becomes immediately evident by an overflow at the gage.

Within the machine a "through flow" will carry with it all particles of dirt and therefore pockets without drainage should be avoided. All waste must be carried to the sump for deposit or to the filter.

It is necessary at some units to redistribute the flow of oil from the main duct leading from the distributing reservoir. This redistribution is in order to reach all parts of the mechanism more directly and to avoid a too devious passage which may cause trouble. With a definite passage providing a reasonable volume of flow, gravity is the only force needed to keep it constant, providing of course that the supply is maintained. In Fig. 3 is a machine having a gage to show the supply. The diagram on the column tells where to fill and drain the system.

In almost every machine there are moving parts that vary in position or constitute outlying units. Where possible, with short range of motion, a flexible duct may be used, or, with recurring periods of fixity, a flow timed to such periods may be provided. But it is very often necessary to provide a separate system where the need justifies it, or to resort to the older method of auxiliary reservoir and splash, or oil ring, feed if the purpose merits no more effective method.

Face bearings present still another set of conditions. With the best of protection dust and dirt will work in. Ducts will become clogged unless the flow is so great as to become wasteful. Forced lubrication with a heavier lubricant meets these conditions if sufficient pressure is applied to clear the passages and force out the dirt with a lubricant heavy enough to accomplish this and stick to the ways. But not a grease.

With this indication of what comprises a satisfactory system and what forms the basis for judging comparative methods, a survey of recent installations made by a machinery builder and user may prove interesting. Sixty-nine units of equipment have been installed dur-

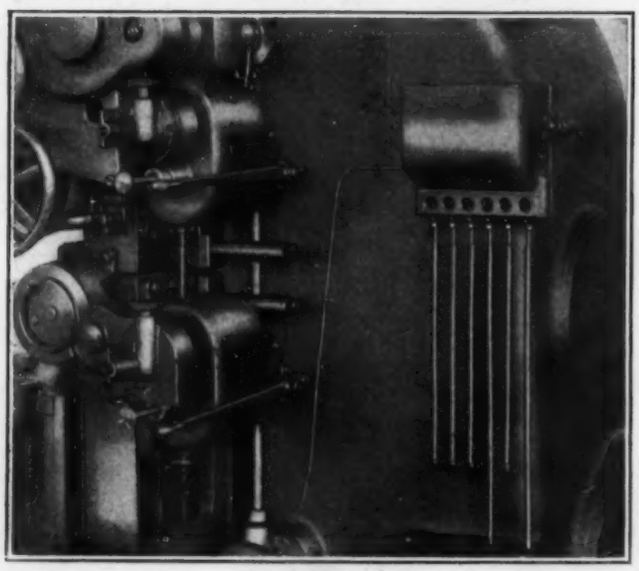


Fig. 2—Machine equipped with an oil filter and with ducts leading to all bearings. Each duct has a sight-feed gage

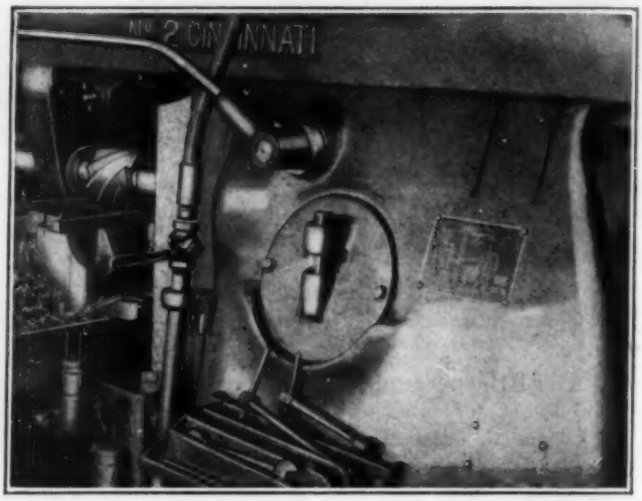


Fig. 3—A gage in the oiling system of this machine shows the oil supply. The diagram tells how to fill and drain the system

ing the last sixteen months. These include almost the complete range of machine tools for various purposes. Preference was given to the machines in each class that provided an adequate system of lubrication, comparable with that described.

Eleven units of his own manufacture met with these specifications which have been standard in his design for approximately twenty years. Of the remaining fifty-eight machines: Three by one maker completely met the requirements. Four by another maker satisfactorily approximated them. Several included the splash system for one or more operating units in each machine, but practically half of them depended entirely on the "squirt can" method with numerous cups or oil holes more or less protected from dirt.

It is fair to state that only a part of those machines are specifically designed for mass production, but it does not follow that higher developments for production purposes and the methods of lubrication coincide in the same machines.

The editor was right—there is still more "positive lubrication needed" and it is not alone the older models of machinery that keep alive the question of "who should keep machines oiled." Age does not always signify obsolescence.

The All-Around Machinist Still Has a Large Field

WHEN one gets the notion that the day of the all-around machinist has gone by and that only the specialist can find a place to earn his living, there is a never failing antidote—go to a sparsely settled country such as our own West, or Mexico, Cuba or Jamaica. In places of this kind the all-around man is still king, and the specialist hasn't much more chance than the proverbial snowball.

Machine equipment is, of necessity, limited to such tools as can handle a large variety of work. And with these as a starting point the mechanic is expected to devise ways and means of making them perform operations of which their designers and builders never dreamed. Work that is too long for any lathe in the shop may be turned on two lathes, or even on a planer.

Automotive Production

Crank Production and Assembly for Indian Motorcycles

How the crankdisks, or flywheels, are made and balanced—Twin connecting rods bear on a single crankpin—Fixture for assembling balance wheels

THE crank of the twin-cylinder motor made by the Indian Motorcycle Co., of Springfield, Mass., is a double-balanced disk, joined by the crankpin, which is fitted to a tapered seat in both disks and further secured by a nut on the back of each disk. As the motor is expected to run at a normal speed of 3,600 r.p.m., and at times may be called upon to run as high as 4,500 r.p.m., it is necessary to balance the revolving and reciprocating parts very accurately.

The two disks of which the crank is composed are practically identical, being made from the same pattern and passed through the same sequence of manufacturing operations. They are made in the shape of a balance wheel with a comparatively heavy rim section for the sake of the flywheel effect, and with a balanced web crank instead of spokes. One of the disks may be seen to advantage in Fig. 1, where it is set up in a special chuck in a Potter & Johnston machine for the roughing operations.

This machine is tooled up to drill and taper ream the hole for the central shaft, to face the hub, and to face both sides of the rim and to turn the periphery at one setting. To allow the inner facing tool to pass between the work and the chuck, the latter is provided with jaws that grip the rim of the wheel from the inside, the design of the wheel permitting this to be done. The action of the machine is automatic except for unloading and reloading, and when it completes its work the wheel is a very smooth looking job, though no part of it is yet finished.

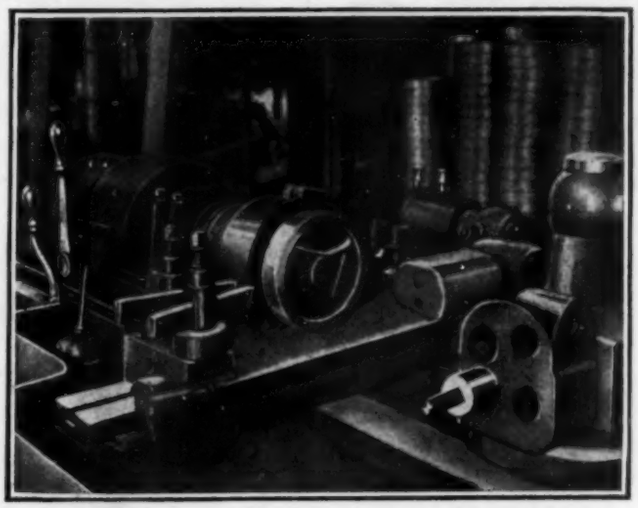


Fig. 1—Rough-turning the balance wheels

Fig. 2—Finish-turning balance wheels

The roughing machines are kept well ahead of the subsequent operations so that the castings may have an opportunity to season after the scale has been removed, such treatment adding materially to their stability. As a part of the roughing operation the offset hole for the

Automotive Production

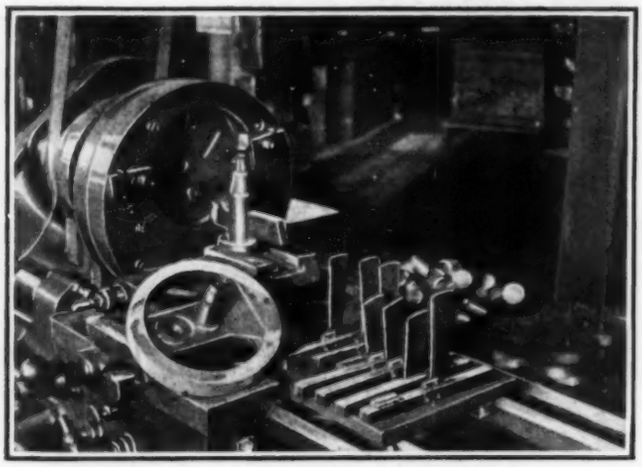


Fig. 3—Facing and boring the bosses

crankpin is drilled and taper reamed, the work being done on a vertical drilling machine of the "caster" type immediately after the rough turning.

Upon resuming the sequence of operations both sides of the central boss are again faced to give the required length of hub, these finished faces becoming the points of departure from which are taken all measurements having to do with the overhang of the rim and the longitudinal relation of the wheel to other parts. This work is done in standard engine lathes without special appliances. The rim is not touched at this time. A balanced faceplate is used to swing up the wheel to face the back of the offset hub.

While the wheel is in the lathe for the facing operation on the central hub, which was taper reamed nearly to size in the roughing operation, a boring cut is run through with a single point tool. The relation of the taper seat to the face of the hub is important and a special gage is provided to test it. The gage consists of a hardened and ground taper plug, to the handle of which is threaded a graduated ring similar in principle to the thimble of a micrometer. Turning the ring backward or forward upon its thread advances or retracts its face with relation to the taper of the plug, which it partly covers.

A pin, fixed in the body of the plug, engages an open slot in the ring so that the rotative movement of the latter is restricted in both directions to an amount on either side of the zero line that corresponds to a longitudinal movement of 0.001 inch. The plug must fit tightly in the bored hole within the limit of movement of the ring.

With the ring turned back to its limit the plug is wrung into the taper hole to be gaged until it sticks. If it will not stick, the hole is already too large. Assuming that it does stick, the ring is turned forward until its face bears against the face of the hub; when the graduation should read zero. If the ring can be turned to its forward limit before it strikes the face of the hub the hole is too small and must be rebored.

After a keyway has been cut in the bore of the wheel, the stud that forms a part of the main shaft is forced into place and further secured with a nut. The assembly is then placed on centers—the centers of the shaft—in the engine lathe shown in Fig. 2 for the finishing cuts over the rim. This lathe has two toolposts in the usual place and upon the rear of the carriage is a third toolpost, the latter carrying the tool that turns the diameter of the wheel to finish size.

The rear tool is brought into action first, by engaging the regular feed movement of the carriage and allowing it to feed across the rim of the wheel. The operator then sets the gage *A* upon the shaft, to which it aligns itself by reason of the inverted V-groove in the base, and brings the two hardened studs (one of which may be seen at *B*) in the end of the base into contact with the face of the wheel hub to position the gage longitudinally; this face being, as before mentioned, the point of departure for all measurements except diameters.

The gage is now allowed to turn about the shaft until the block *C* reaches the facing tools before the wheel, being held to the shaft by the hand of the operator, and the carriage adjusted longitudinally by hand until the block will just pass between the tools. Locking the carriage in position, the facing cut is run across the rim, not only bringing it to finish thickness but at the same time locating it exactly with reference to the face of the hub.

To face the offset hub and to bore the tapered hole to receive the crankpin the wheels are strapped to the faceplate to be seen on the lathe in Fig. 3, where the rim of the wheel bears upon three studs that are set into the plate and face-ground in position. The plate is counterbalanced so that the lathe may run at relatively high speed without undue vibration. The counterweight is covered by a shroud that presents a smooth surface and does not involve a hazard to the operator.

Though both the center and offset holes were formed in the first place with a taper reamer in order to remove the stock quickly, the finish in each case is made by a single-point boring tool, guided by the taper attachment of the lathe in which the boring is done. The offset hole is finish-bored after the center shaft has been

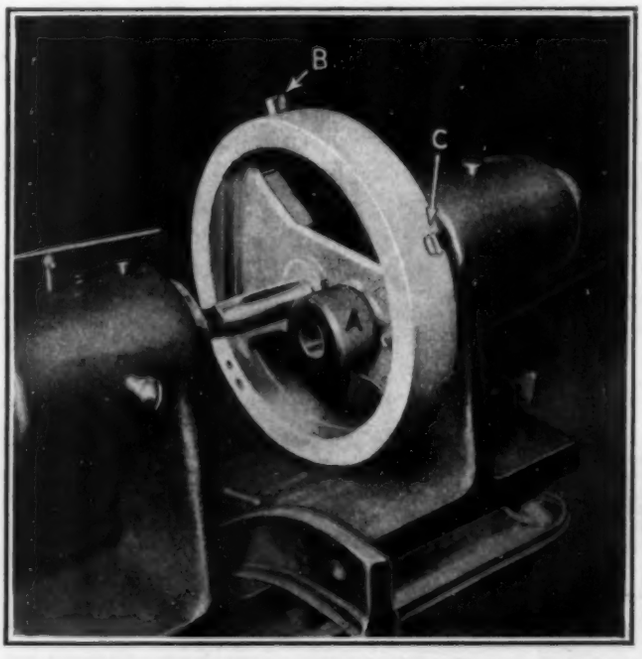


Fig. 4—Preliminary balancing operations

Automotive Production

set in the wheel, the shaft entering and being located by a bushing in the faceplate to insure exactness of the radial measurement and uniformity of parts. The lathe shown in Fig. 3 is used for the purpose, though the actual job on which it was engaged at the time the photograph was made was counterboring and facing; which accounts for the number of amplifying gages to be seen lying on the shears of the lathe, just to the right of the carriage.

About the last operation upon the crankdisks, or balance wheels, to be performed in the machine shop is the balancing. As the actual running balance involves a portion of the weight of the pistons and other attached parts, this job is a carefully worked out compromise. Fig. 4 shows the method and the appliances used. This is not the final balance, however; that is done in the assembly room with all parts in place, and will be described later.

This preliminary balancing is done with the wheel supported by the shaft centers upon a pair of centerpoints that, for the sake of convenience in conducting the operation, are temporarily clamped to the table of a multi-spindle drilling machine, in one spindle of which is the drill used to accomplish the transfer of weight.

A leaden weight is cast around a tapered steel stem, made to fit the offset hole in the wheel and threaded at the small end for a nut. This weight is first put in position and secured by the knurled nut *A*, screwed upon the projecting end. The weight of this appliance is so calculated with reference to the weight of the pistons and connecting rods that the wheel when brought into static balance with it in place will be nearly in running balance when all the parts are attached. The wheel, when the operator gets through with it, is, of course, far from being in static balance with the weight removed.

The balancing is done by drilling holes in the rim on the heavy side. The small pieces *B* and *C* to be seen projecting from the rim of the wheel are cubes of hardened steel so strongly magnetized that their weight will be sustained by the magnetism in any position they may occupy. The operator has a number of these cubes of different sizes, corresponding to certain depths of hole that must be drilled with a $\frac{1}{4}$-in. drill in the rim of the wheel in order to remove a corresponding weight of stock and restore the balance of the wheel.

With the wheel on centers and the heavy side approximately located, the operator attaches one or more of these little magnets to the rim, changing their position or substituting different sizes as his judgment dictates until the wheel is in static balance. Each magnet is numbered, and a glance at the number (the experienced operator does not have even to look at them) tells the operator how many inches or fractions thereof he must drill into the rim of the wheel. The active quill of the drilling machine is graduated in inches so that he may know the depth to which the drill is penetrating without otherwise measuring the holes.

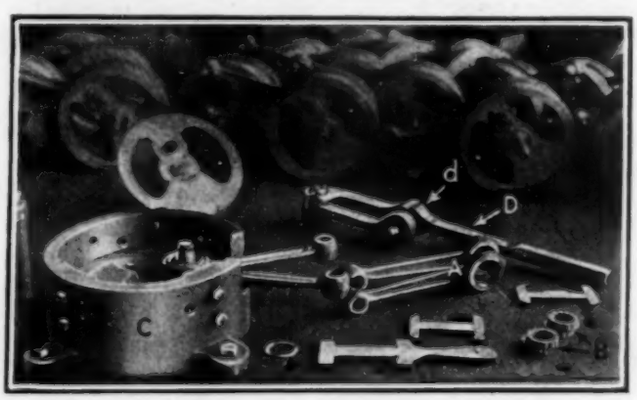


Fig. 5—Assembling the units

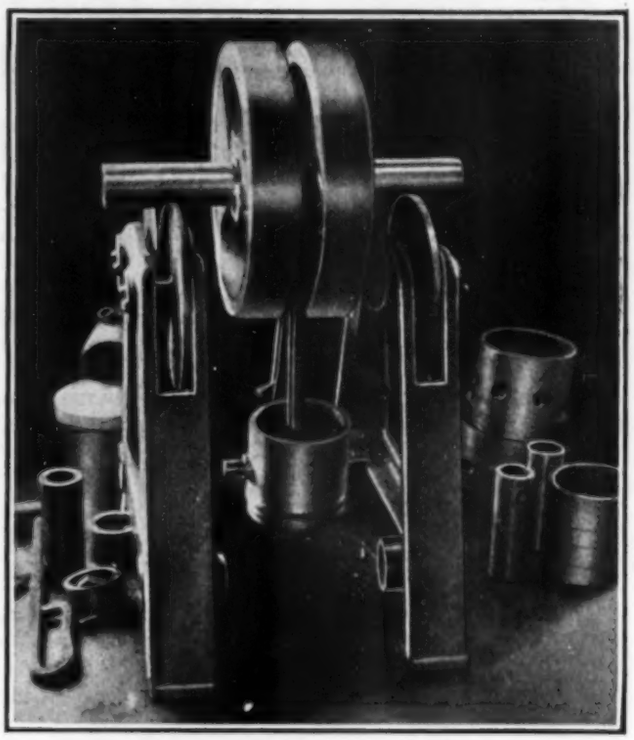


Fig. 6—The final balancing

This is a job that looks very simple, yet requires a considerable degree of skill to accomplish it quickly and accurately. By the time the wheel is in temporary balance there may be several of the little magnets sticking out around the rim, and that the operator can drill the right number of holes to the right depth and in exactly the right place upon the first trial (which he generally does) is a distinct credit to his skill.

A fixture in which the balance wheels, crankpin, and the twin connecting rods with their roller bearings are assembled into a unit is shown in Fig. 5. At *A* may be seen a pair of the connecting rods and the manner in which they are fitted together. The distance between opposite faces of the double boss of the lower rod (as seen in the illustration) is the same, minus clearance, as that between the opposed faces of the crankpin bosses of the assembled unit. The boss itself is cut away in the middle to allow the other rod to enter. The method of making this part is simple, and is of interest.

Both rods are drop-forged, one of them with a narrow boss and the other with a wide one. To bore and face the holes and to convert the single wide boss into two narrow ones the rods are swung up, separately, in a special chuck that grips them by the boss. The machine used is a Jones & Lamson with a cross-sliding

Automotive Production

head. Boring the holes and facing both sides of the boss can be done in one setting by very simple tools, the cross-sliding head of the machine furnishing the movement necessary to the facing.

In the same manner and by the use of the same simple tools a chamber is made midway of the length of the wider boss, the diameter of the chamber being enlarged until it coincides with the outside diameter of the forging and cuts away the wall. By this means all of the stock is removed except at the point where the boss merges into the web of the rod. Except for a very minor milling cut, performed in a hand milling machine, and a little hand filing, the rods are ready to go together.

The thrust of the rod on the crankpin is borne by a four-row roller bearing, two rows of rollers being in the single boss at the center and one row in each of the outside bosses of the other rod. The bearings may be seen at *B* in this illustration. Hardened steel bushings are pressed into the rods to present a proper wearing surface to the rollers.

As may be seen in Fig. 5, the balance wheels come to this part of the assembly bench with the central shafts already set in the bores of both wheels (a job that was done in the machine department before the final turning, as previously described) and with the crank pin in place in one wheel of each pair. This wheel is put into the fixture as at *C* with the central shaft entering a bushing in the base. Adjustable screws in the wall of the fixture confine the wheel, and lugs projecting from the base of the case enter the openings in the web of the wheel to keep it from turning. The roller bearings are set into the bosses of the rods and the latter placed over the crankpin, after which the other wheel is inverted over the crankpin and secured by screwing the nut on the latter. The use of this fixture for the assembly insures the proper alignment of the two parts of the central shaft.

The manner of securing the shafts and crankpins in the wheels is the same at the four points involved except that the center shafts are keyed and the crankpins are not. In the series of lathe operations partly shown by Fig. 3 the backside of each boss is counterbored to receive a large hexagon nut, which screws on to the shaft or pin, and a hole is drilled and tapped to receive a small screw to secure a retaining plate that slips over each nut and prevents it from working loose.

Strain-Proof Wrench

To set up the nuts sufficiently tight without danger of overstraining them, the special wrench to be seen at *D* in Fig. 5 is employed. Above and in line with the socket that engages the nut is a spring-loaded joint *d* that allows a definite amount of turning moment to be applied. Excess energy applied to the handle only causes the spring joint to yield, so that the operator is concerned only to pull hard enough to deflect it, knowing that when movement takes place there the nut is under all the strain that is allowable.

The final balancing is done immediately after this assembly. The unit is placed upon the device shown in Fig. 6, where the crankshaft rests upon two pairs of ball-bearing disks of relatively large diameter and practically no resistance is opposed to a turning movement.

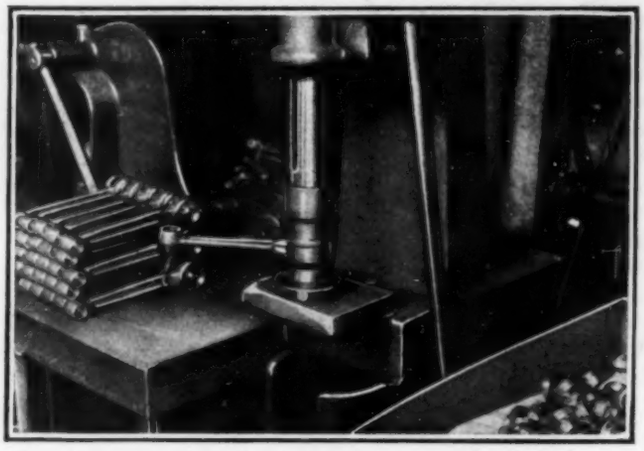


Fig. 7—Setting bushings in connecting rods

Both piston rods are, of course, in place, and one piston only is suspended from one of the rods, this giving the correct condition of running balance.

The unit must be in static balance in all positions. So carefully has the problem of balancing been worked out that correction has rarely to be made at this stage, but when it is necessary it is accomplished in the same manner as in the preliminary balancing, by drilling the ⅛-in. holes deeper into the rim, or drilling the rim diametrically opposite to the first holes in case of overbalance.

The holes in the bosses of the connecting rods are finished by grinding, in order to insure uniformity of pressure when setting in the steel bushings. Fig. 7 shows how the latter job is done in an arbor press. A shouldered stud in the ram of the press receives the bushing and guides it to place, and a thick washer placed between the double bosses prevents the bushing from being forced through the hole. The rod is turned over to receive the other bushing.

Cylinder Wall Finish

CYLINDER wall finish is perhaps the most disputed topic in automobile shop procedure at present. Opinions differ in almost every shop as to just what kind of a surface is best for both the quick running-in of the cylinder and rings and the longest life after it is in operation.

Both makers and users of honing machines have given the subject very careful study and have experimented with all sorts and grades of cylinder wall finish. Honing machines and hones have been developed to the point where almost any desired surface can be secured. The great difficulty seems to be in finding just what kind of surface different users want. When the production engineer decides what he wants, he can usually get it by co-operating with the maker of the apparatus used.

One difficulty is that the question of piston ring material and piston ring finish also has a bearing on the problem. Narrow rings, from racing practice, have come to be standard practice and cast iron still holds sway as the best material. Ring friction is a considerable item in engine loss but so far the ringless piston has not been successful, except in a few experiments.

Applying Electrical Equipment to Production Machinery

By ROBERT COREY DEALE
Electrical Engineer, Niles-Bement-Pond Co.

Drive for boring mills—Motors and controllers for clamping and traverse service—Shaper equipment—Motors for belt-reversing planers—Automatic controllers for reversing planer motors

VERTICAL boring and turning mills are fundamentally vertical lathes, and as such use much the same type of electrical equipment. The main difference lies in the fact that the operator's position is fixed, rather than movable as in a lathe, and hence spline-shaft control is unnecessary. The boring mill is another machine that could well be controlled through a pendent switch, although such control is unusual.

A d.c. boring mill is usually driven by a shunt-wound adjustable-speed motor, controlled by a drum or by an automatic controller with push-button master switches. Small machines requiring a 15- to 20-hp. main driving motor may well be controlled by a drum controller, while automatic controllers are desirable for the larger motors. Large drum controllers are as expensive as automatic panels, are clumsy to operate, and cannot give the protection to the motor given by the automatic controller. With an automatic controller a field rheostat should be used to permit adjustment of the motor speeds. Fig. 90

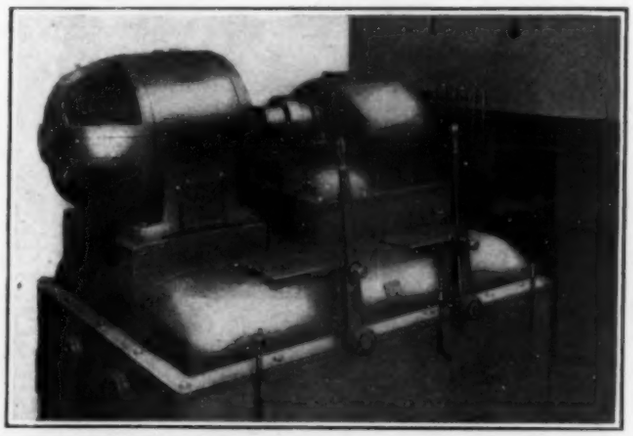


Fig. 90—Adjustable-speed d.c. motor driving a large boring mill

shows the mounting of an adjustable-speed d.c. motor on a recent type of vertical boring mill.

Alternating current boring mills usually have a constant-speed squirrel-cage induction motor for a main driving motor, with a gear box for obtaining the speed changes. The controller should preferably be automatic, non-reversing, of the primary-resistor type, and with one or more push-button stations for starting and stopping the motor. One button should be placed on the front housing, as shown in Fig. 91, convenient to the operating position, another, for jogging the motor, near the gear shift levers, while a third might be desirable

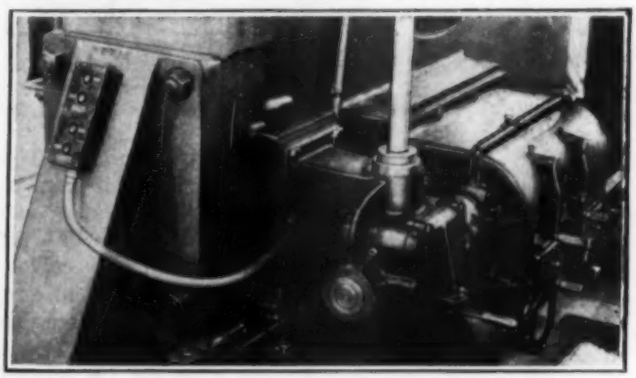


Fig. 91—Location of controls for a 36-ft. boring mill

at times, located on the back upright. If a multi-speed squirrel-cage motor be used, the gear box may be eliminated. In this case an additional drum is necessary to obtain the several speeds by changing the motor connections. A friction clutch is frequently provided for starting and stopping the table.

Large boring mills, in addition to the main driving motor, may have a motor for elevating the cross-rail; two motors for rapid traversing the two rail heads; a motor for traversing the uprights of extension mills forward and back; and from one to four motors for clamping the cross-rail to the housings.

Constant-speed traverse motors are usually provided for elevating the cross-rail, traversing the heads or traversing the uprights on the larger machines. There may be one or several of these traverse motors, depending on the mechanical requirements. The same types of equipment are used as on lathes, that is, compound-wound d.c. motors and high-resistance squirrel-cage a.c. motors. Small reversing drum controllers are satisfactory for operating these motors, although it may be desirable to use automatic controllers because of the greater convenience of push button control.

It is believed advisable to completely inclose d.c. traverse motors. When they are left open, dirt has a

The eleventh article. The twelfth will appear in an early issue.

tendency to collect on the windings and commutator. This dirt contains a large percentage of metallic dust and is very likely to cause breakdown of the armature insulation. It forms a low-resistance path between the armature conductors at points where the insulation is weak, and the frame of the machine. With squirrel-cage motors there is not so much chance for trouble because there is no commutator and no insulated rotor winding, although the stator windings may cause trouble. A motor used to operate a clamping device must be designed to give a maximum stalling and starting torque, with a reasonable current consumption so that the heating of the motor itself will be limited, and with a light-load speed which is not much greater than the full-load speeds. A series-wound motor seems to be most satisfactory for both a.c. and d.c. circuits. The motor should preferably be so built that it can be stalled without the use of any external resistance, and should be capable of being left stalled on the line for some short time, five minutes, for example. The armature may be shunted to reduce the no-load speed and, consequently, the shock with which the clamping mechanism comes to rest when the motor is stalled. A small reversing drum switch with a spring for returning the switch to neutral as soon as the handle is released is usually used to control a clamping motor. A small automatic reversing controller may be used when push-button control is desired, but is unnecessary.

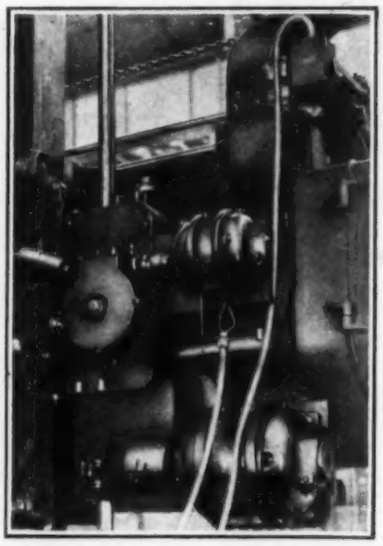


Fig. 92—Clamping and traverse motors on large boring-mill cross-rail

Alternating-current series motors are advisable for clamping service not only because they have desirable electrical characteristics, but also because they may be conveniently stocked. Single-phase series motors may be used on single-, two- and three-phase circuits and may be designed to be used on circuits of any desired frequency. Taps may be brought out for 220- or 440-volt connections and such motors may be used on 550-volt circuits by the use of a small series resistor.

Specially-designed squirrel-cage motors are very satisfactory—in some cases they may be more satisfactory than the single-phase series motors—but they have the disadvantage that the windings differ for each phase and frequency. Consequently, a much larger number of motors must be stocked.

In one 36-ft. boring mill, there is a motor for clamping the cross-rail to the inside and another to the outside of each housing, making four in all. These four motors are controlled from a single magnetic reversing switch. Fig. 92 shows one of these clamping motors outside of the housing, together with the clamping mechanism. The lower motor is for feeding and rapid traversing one of the heads.

In Fig. 93 is shown the rear of a small side-head boring mill. This arrangement of the drive is not as good as that shown in Fig. 90, but it is more economical of floor space. The driving motor is a constant-speed compound-wound d.c. motor. For such service a series field is unnecessary, as a clutch is used for starting and stopping the machine. Any type of starter may be used on such a drive, but a manual faceplate starter providing undervoltage protection would seem to be very satisfactory. Overload protection may be obtained by the use of fuses or a circuit breaker with an overload coil. For a.c. circuits, a standard squirrel-cage motor with a manual, resistance-type starter would be satisfactory.

The general class of planing machines may be divided into standard planers, open-side planers, crank planers, slotters, shapers, plate planers, and wall planers.

These may be further separated into those machines in which reversal and adjustment of the stroke is obtained through a crank; those machines in which there is some other form of mechanical reversing mechanism such as an open-and-closed belt drive, with appropriate shifting levers; and those machines in which reversal of direction is obtained by reversing the driving motor.

Shapers, crank planers, and nearly all slotters fall into the first class. The crank is usually of special construction, so that on the return or idle stroke the speed of the table or ram is higher than on the cutting stroke. A machine of this class may be driven by a constant-speed motor with speed change gears or by an adjustable-speed motor without the gear box. If direct current is available, the adjustable-speed motor is preferable.

For direct current, a shunt- or compound-wound constant-speed motor, with a non-reversing, dynamic-braking drum controller is very satisfactory for machines in which all speeds are obtained mechanically, such as the shaper shown in Fig. 94. If an adjustable-speed motor

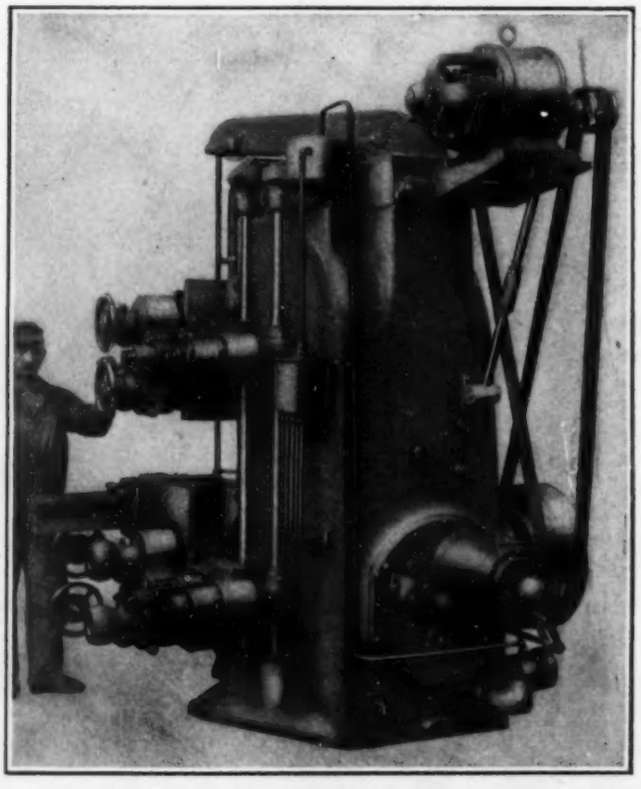


Fig. 93—Drive for side-head boring mill

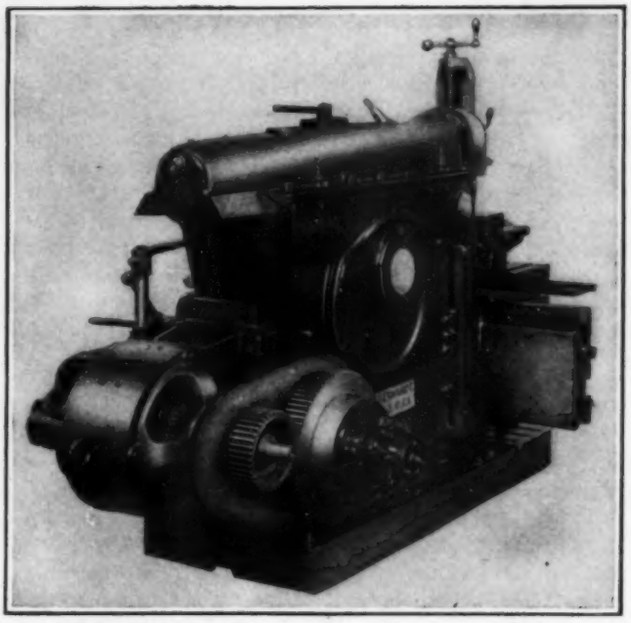


Fig. 94—Shaper driven by a constant-speed d.c. motor

is used, the drum should be capable of acting also as a field rheostat. With shapers it is particularly desirable to provide undervoltage protection, as the operator is very liable to injury, should the machine start up unexpectedly. An automatic, non-reversing, dynamic-braking controller with a start and stop push button and separate inclosed field rheostat is also very satisfactory, and may be found to be actually cheaper than the drum controller. For a.c. driven machines, a squirrel-cage induction motor should be used, with a manual-resistor or compensator-type starter. These types of starters are usually arranged to give undervoltage and overload protection.

Nearly all planers built up to about 1909 came in the second class. Shifting belts or clutches were used to transform the uni-directional rotation of the motor to the reversing movement necessary on the table, or tool. Reversing clutches were used for a comparatively short time, and were not entirely satisfactory. The planer drive through shifting belts is still used, however, particularly on the smaller planers. This method makes an inexpensive, simple form or drive, particularly in cases where the machine has a short table. As the horsepower of the driving motor is increased, it becomes more difficult to shift the belts, and they give more trouble. Very few planers larger than 48 in. are now built for belt drive.

Planers driven from a constant-speed motor through reversing belts are nearly always driven by a.c. motors. Where direct current is available, the flexibility of speed control and the convenience of handling d.c. reversing motor equipment insure its use.

Standard squirrel-cage motors are used where alternating current is used for power. Any standard starter may be used, but it is believed that a manual starter giving undervoltage protection and having fuses for overload protection is entirely satisfactory. Such a starter is certainly cheaper than an automatic controller.

Multi-speed squirrel-cage motors may be used, but they have the disadvantage that the return and cutting speeds are changed together. As it is the sum of the speeds of the cut and the return belts that is the limiting factor in the design of a planer, the maximum return speed is limited to 80 or 100 ft. per min. if a cutting speed of around 30 ft. per min. is desired. If the cutting speed is decreased, the return speed drops with it, so that the planer takes longer to make a complete cycle at a given cutting speed for a given length of stroke, than if the return speed could be held at its highest practicable value.

Planers driven through reversing clutches, whether pneumatic or otherwise, have the same type of electrical equipment as used on the planers through belts. This type of drive has been discontinued on planers in the United States as far as new machinery is concerned. Those now in use are being changed over to automatic reversing-motor drive as rapidly as possible to avoid clutch trouble, and to secure the adjustable cutting speeds.

The majority of planers now being built are driven by a motor which is automatically reversed to obtain

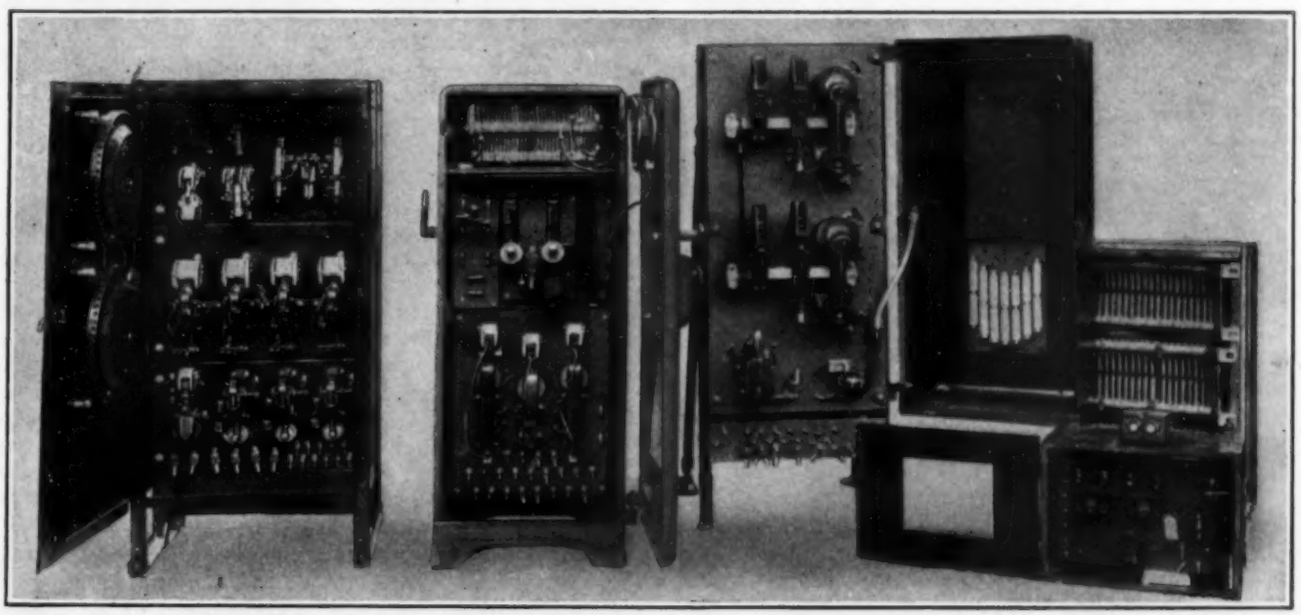


Fig. 95—Three types of automatic controllers for reversing planer motors

reversal of the table. This type of drive may be separated into two main divisions. In the first, which is the older development and includes the larger part of the equipments in use, the planer motor is reversed through an automatic magnetic controller. This type of controller at present is practically limited to use on direct current.

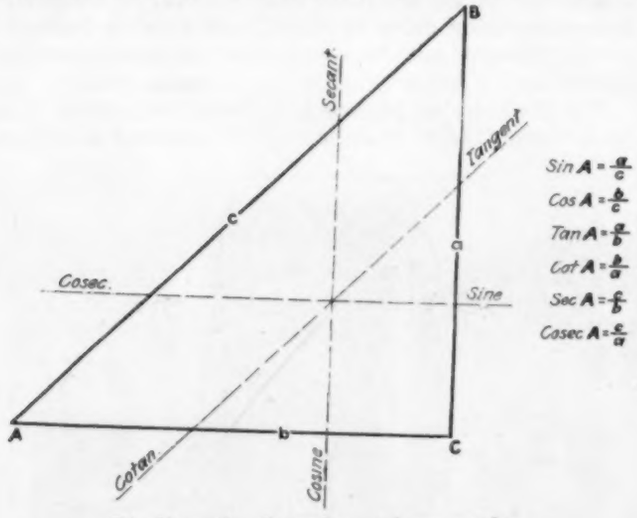
In Fig. 95 are shown three similar 40-hp. controllers for d.c. reversing planer motors, as manufactured by three prominent manufacturers. Each controller performs approximately the same functions except that the controller in the center of the picture has connections so that the driving motor is stopped at once in case the circuit breaker opens because of overload or undervoltage while the other two do not have this feature.

Three machines are in existence with a.c. reversing motors, but they are in use on special long-stroke planers, and it is believed that they would be unsatisfactory for a standard planer of average stroke. The heating because of the reversing peaks is greater on an a.c. than on a d.c. motor. It is also difficult to make an a.c. controller as rigid as a d.c. one because of the necessity of laminating the a.c. magnetic circuit. Because of the inability to secure dynamic braking, the a.c. equipment must either use a magnetic disk or band brake, or eliminate the safety features that are usually built into the d.c. equipments.

Determining the Functions of an Angle

By B. T. Root

FROM time to time I have seen in the *American Machinist* articles relative to methods of determining the values of the functions of an angle in plane trigonometry. I have long used a simple diagram to tell quickly the values of the functions of an angle in a plane



Finding the functions of an angle

right angled triangle, and have found none more convenient. The formulas together with the method of fixing them in the mind, are shown on the accompanying diagram.

To find the value of any function of angle on the diagram, the broken line corresponding to the function is followed across the triangle, and the function will be found to be the quotient of the two sides crossed taken in the order of crossing.

Carelessness and Accidents

By C. V. Hull

IT HAS been said that carelessness in the United States costs $300,000,000 and thousands of lives per year. From my own experience, I am inclined to believe the statement.

One piece of carelessness cost me quite a bit of time and some suffering. We were removing the shaft from a dynamo armature. I was holding a lead hammer against the end of this shaft while the electrician struck it with a heavy steel hammer. Some one spoke to him and the blow was carelessly directed. The handle of the hammer was in bad order and it broke with the result that the hammer struck my toe and smashed it painfully. In another case it was carelessness from lack of experience. A young man wanted to use an emery wheel with a cone pulley. He tried to shift the belt by hand, though a pole for the purpose was just beside him. Someway the belt caught his dirty glove and in an instant his hand was drawn between the belt and the pulley. Had the belt not jammed the momentum of the wheels would no doubt have broken his arm. As it was the belt and the hand were so tight in the frame about the pulley that two men exerted themselves to loosen the hand which was seriously bruised, but not broken.

Some men forget caution when they are in a hurry. One of these, in setting up a machine which had a six-inch shaft about nine feet long, put the shaft on a small support or horse, but forgot to examine the horse in his haste. It was defective and the shaft smashed his foot. He lost a lot of time and the foot still bothers him.

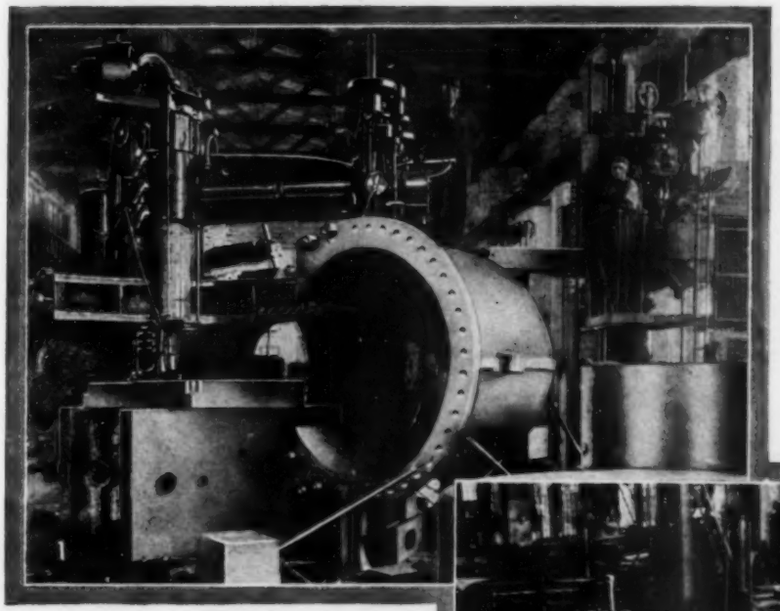
Sometimes, too, careful men seem to forget danger and do reckless things. I remember one who was oiling a machine with an exposed setscrew. He knew about it and had often warned others, but someway he overlooked it and leaned too near. When he struck the ground he was a bit dazed but not injured. He had a pair of shoes on, a pair of socks, and the neckband of his shirt—but nothing more, and was the most surprised man I ever saw. The next time I saw the machine there was a guard over that setscrew.

A most reckless trick is that of climbing up a ladder and reaching over a pulley or shaft. With a loose sleeve or torn garment it is almost suicidal, for any running shaft is dangerous. Sometimes a smooth shaft will wrap clothing. One man of whom I knew had been warned regarding a shaft near which he was putting a run of pipe. Nevertheless he got caught, and the coroner held an inquest. A piece of sheet metal wrapped about the shaft loosely and tied would have prevented any chance of an accident!

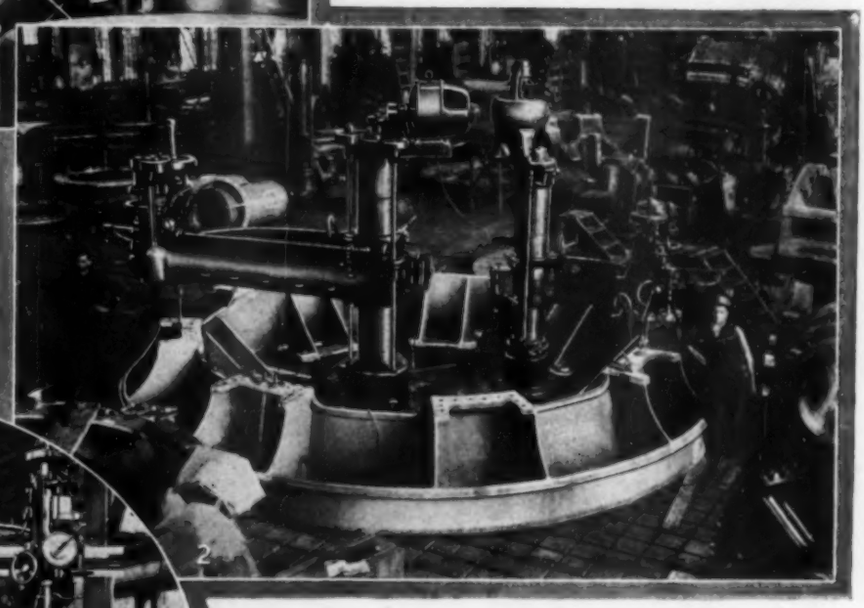
Sometimes carelessness is due to a lack of judgment or a feeling of disgust. A gang of men were doing some work with a hand crane which bound on the track. Becoming disgusted they jammed into the stop blocks at the end of the track to square the crane and make it run easily. They did not realize the force of the blow and the crane jumped the track, squeezed one to death and injured several. The use of any defective machine shows that someone is neglectful.

Undoubtedly most plant accidents are caused by carelessness. Many times men go to sleep and do the very thing they ought not to do. Carelessness, which breaks, injures, destroys material and often kills, is inexcusable.

Floor-Plate Work on Water-Power Equipment

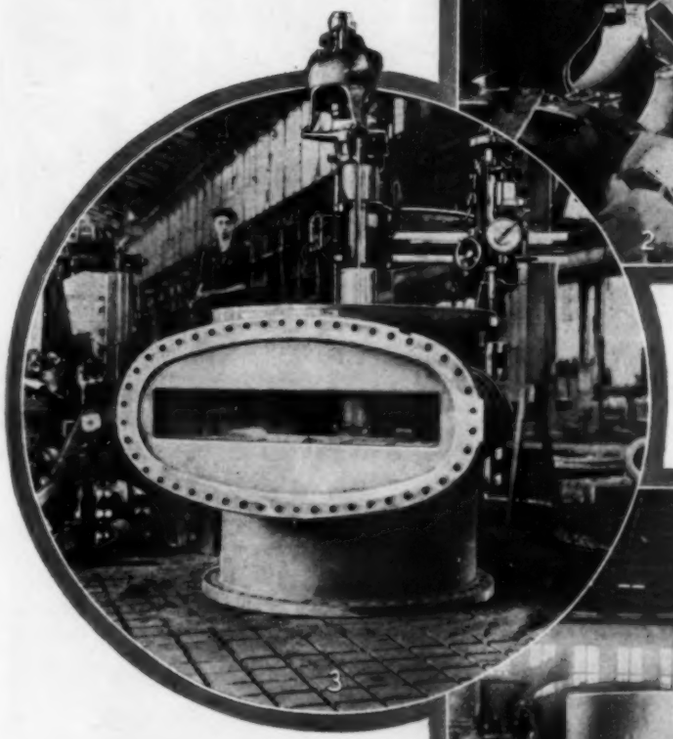


1—Radial drill and draw cut shaper at work in a spiral case—Note mounting of radial

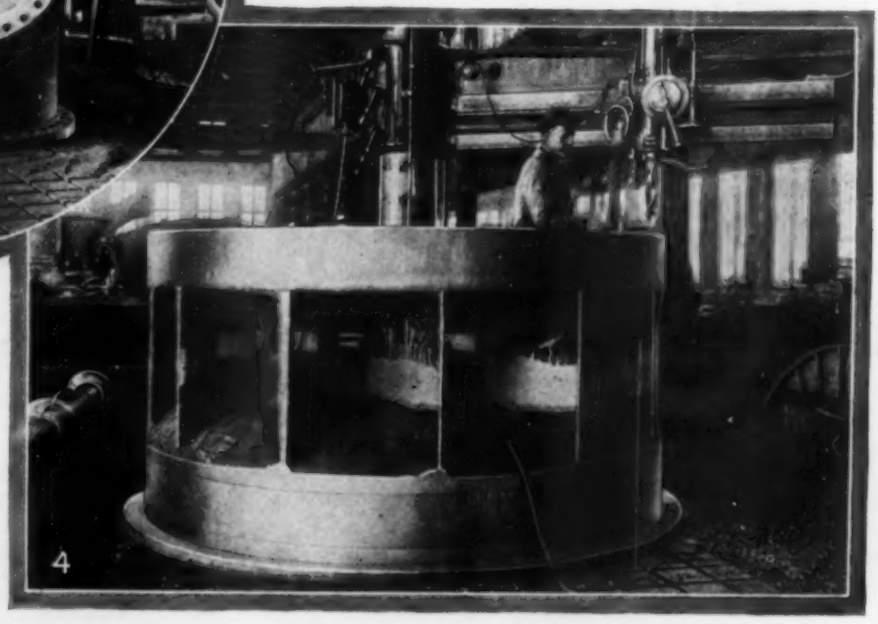


2—Two radials a work on large cast ring

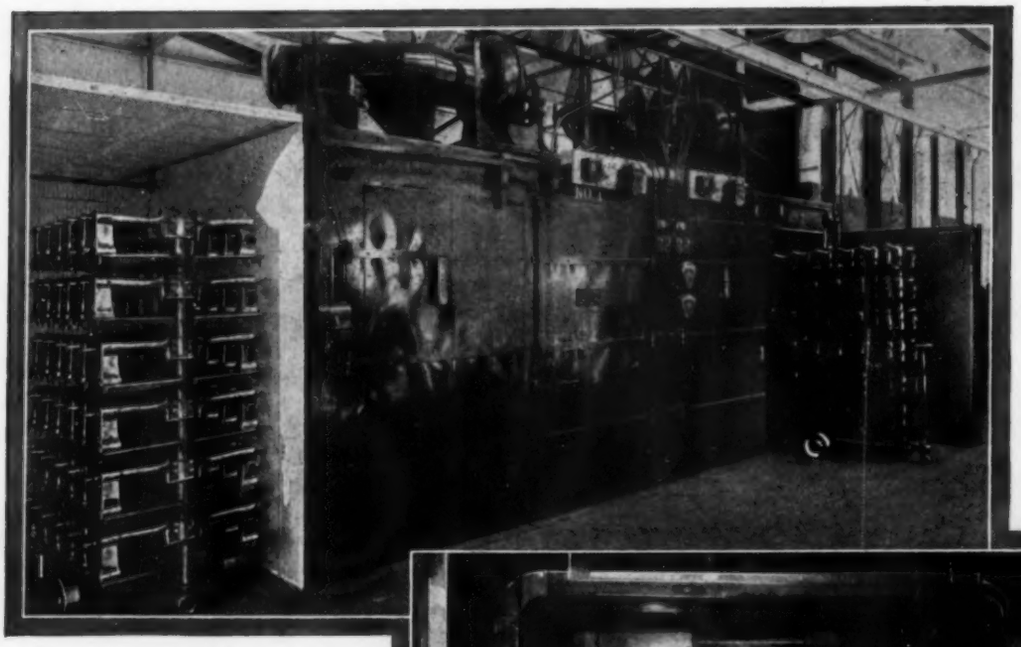
Photographs by courtesy S. Morgan Smith Co., York, Pa.



3—Radial centered in large valve body for drilling flange holes



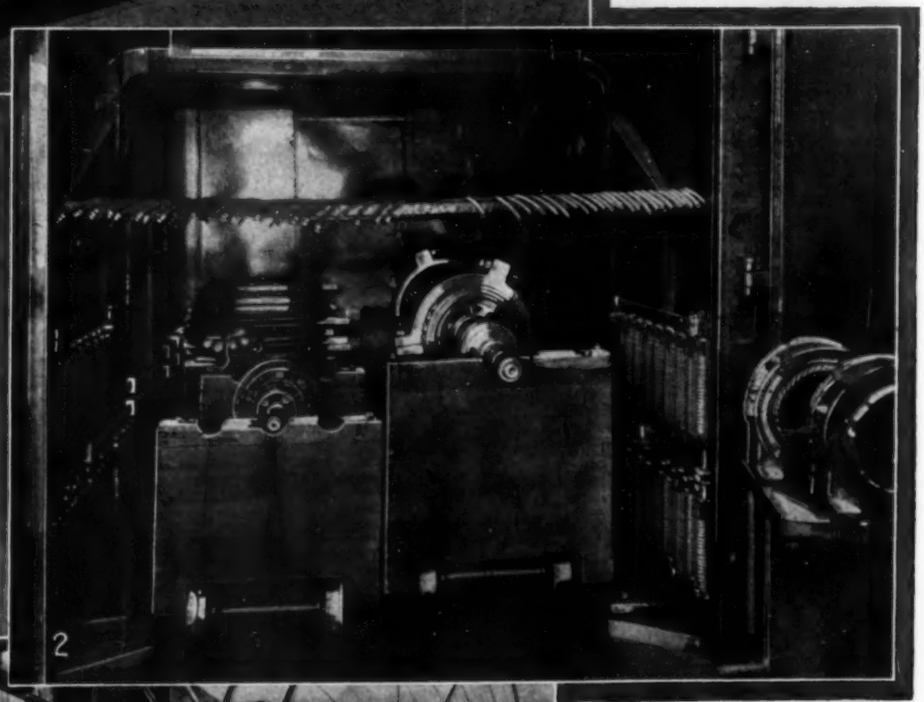
4—Drilling a large runner



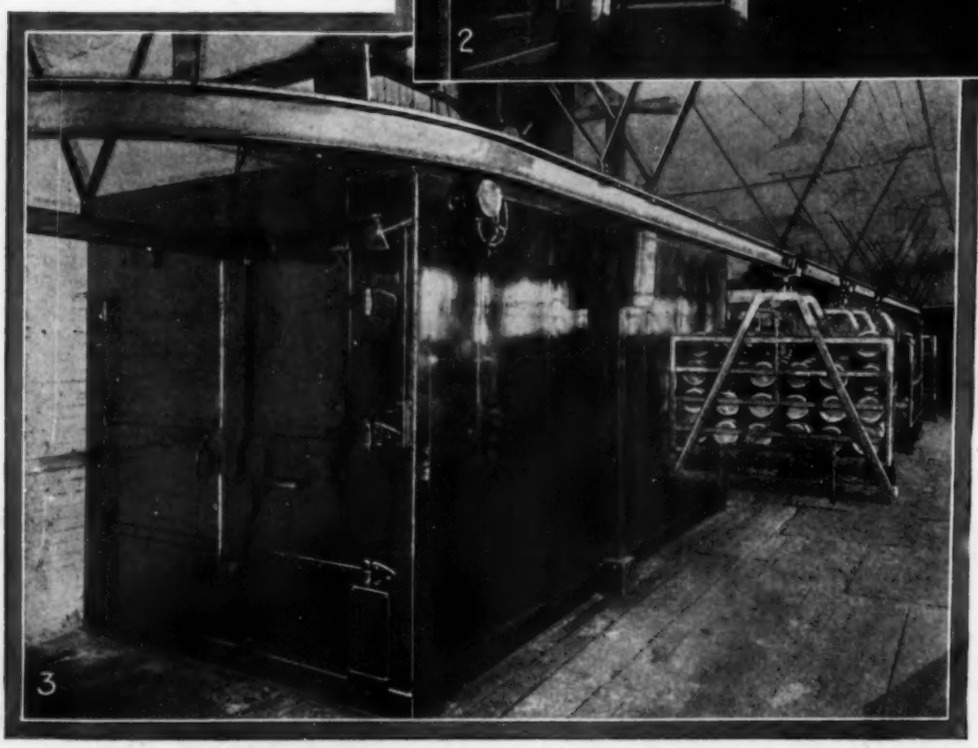
1—How japanned sewing-machine heads are baked. They are held on horizontal rods in trucks holding 72 heads

Using Drying Ovens in Machine Production

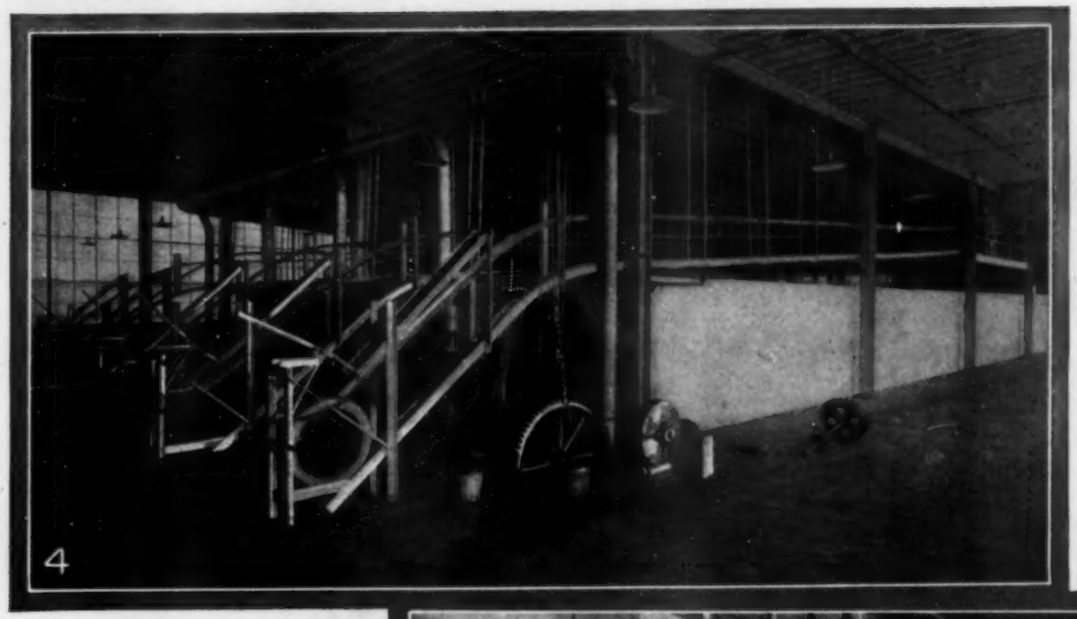
Photographs by courtesy of Young Brothers, Detroit, Mich.



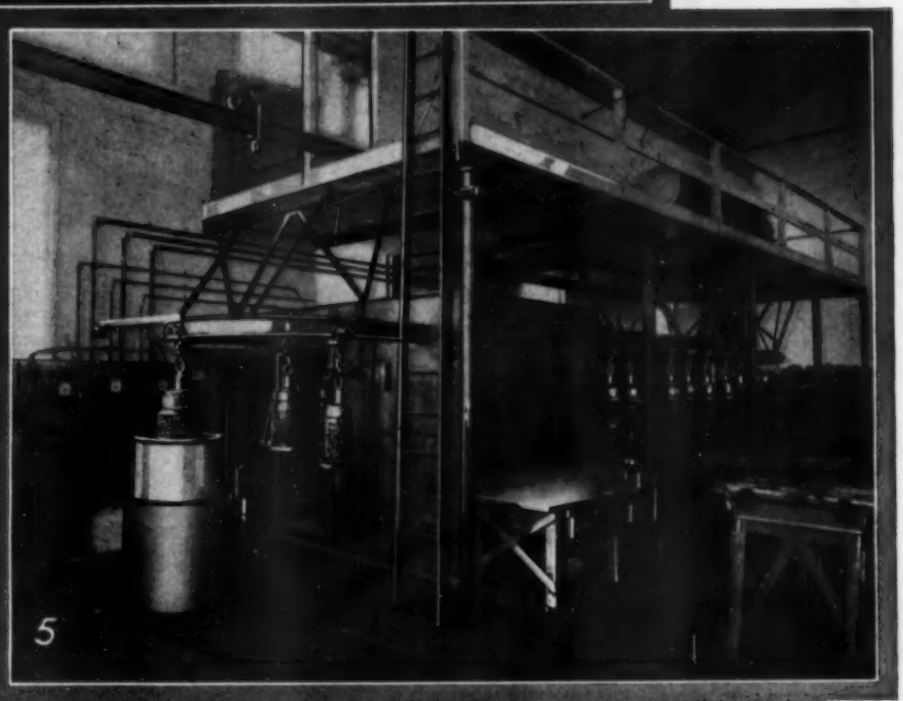
2—Baking railway motor armatures in electrically-heated ovens. Ends of trucks built up of square strips to hold shafts



3—Drying oven in production line. Track turns at left and goes through the oven to the assembly line

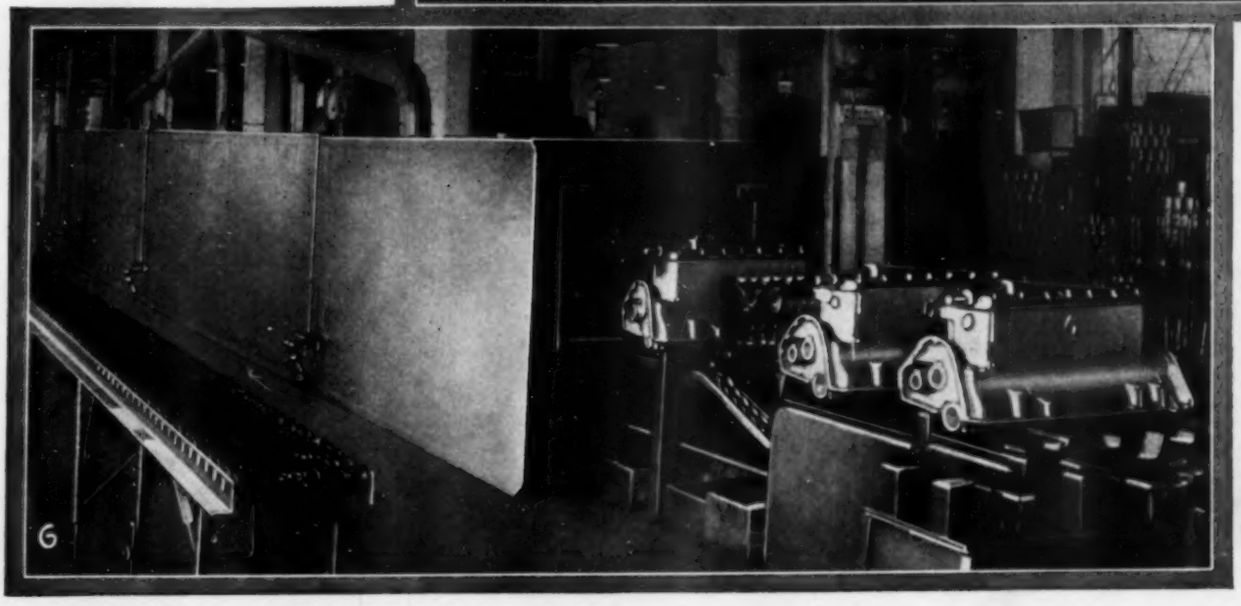


4—Steam baking-oven for automobile chassis. When chassis comes through by conveyors, wheels are ready to be put on the axles

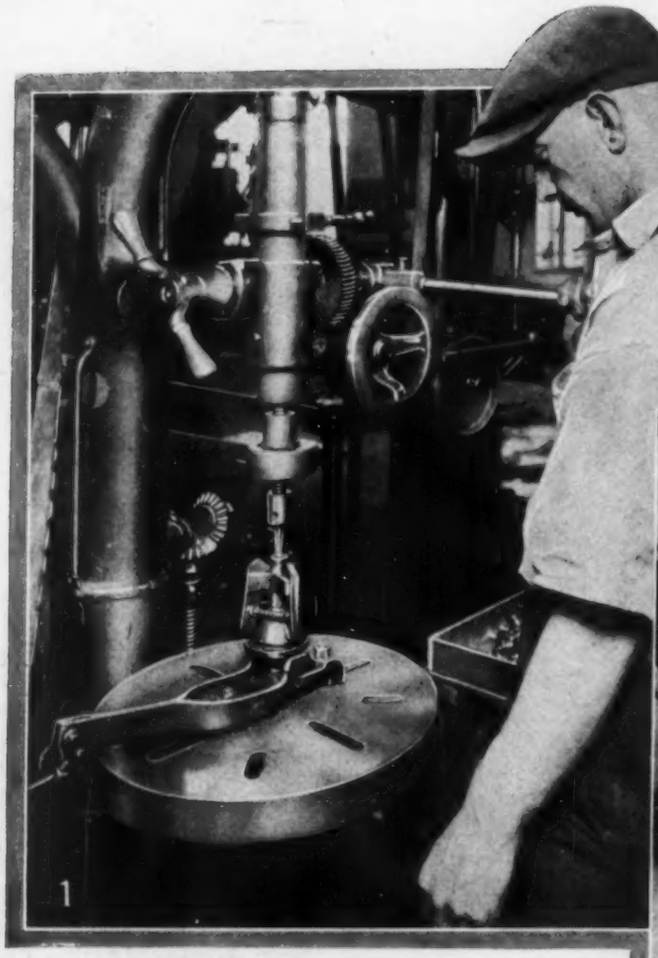


5—Armature oven with tank of insulating compound in front, and conveyor for handling armatures

6—Automobile engines going into the oven on conveyor



Using Hands and Feet in the Shop



1—Foot operated chuck for tapping

2—Using both hands, and feeding by foot pressure

3—Tube bending device. Tube is clamped at *A* and supported by *B*. Tube is bent by rotation of *C*. Spring *D* returns *B* to position after each bend has been made

Photographs by courtesy of The Hoover Co., N. Canton, Ohio.

Manufacturing Tools to Make Safety Razor Blades

By ELLSWORTH SHELDON
New England Editor, American Machinist

Some more of the jigs and fixtures used in making the punches—Setting piercing dies and guide bushings in the punch and shedder

AFTER the blanking punch has been hardened and the dowel holes have been drilled in the soft steel plugs with which the original holes were filled, it is located from these holes on a special chuck in the cylindrical grinding machine where the diameters of the flange and of the rounded ends of the cutting contour, which are truly circular arcs and concentric with the flange, are reduced to size. It is then held by similar special fixtures in an internal grinding machine to grind the holes for the bushings.

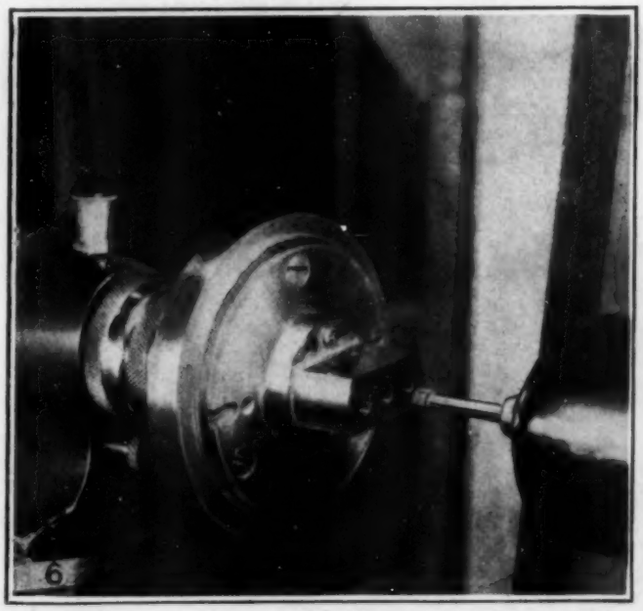
The fixtures to hold the punch for these operations consist of a ring chuck and two plates fitting into it, one to hold the punch centrally to grind the hole for the middle bushing; and the other to hold it in offset positions while the two outer holes are ground. The first plate, shown in Fig. 6, locates the punch from the dowel holes, while the other, Fig. 7, has permanently attached to it a small angle-plate, against which the flat side of the punch bears, and a button to locate the punch endwise from one of its rounded ends. These fixtures center one of the offset holes with the axis of rotation, and to grind the opposite hole the punch is reversed on the plate. A counterweight is attached to the plate to balance the revolving parts.

Having completed the grinding of the punch up to this point, a set of die-bushings selected from stock is forced into the ground holes by means of an arbor press. As the long diameters of the oblong holes in the two outer bushings must be located accurately parallel to the flat sides of the punch, the tool to be seen in Fig. 8 is used to align them and make sure that they remain in alignment while they are being forced to their seats.

This tool consists of a base into which two studs, corresponding in shape to that of the oblong holes in the bushings and fitting them closely, are affixed. The tool is shown in this illustration with one of the bushings on the stud and the other one standing on the bench beside it. Both bushings are, of course, on the studs when the tool is put in the arbor press, where they remain until they are fully seated.

After all the bushings are in place—the middle one, having a round hole, requires no locating—the cross-holes previously drilled in the punch, and now partly

The second article. The third will appear in an early issue.



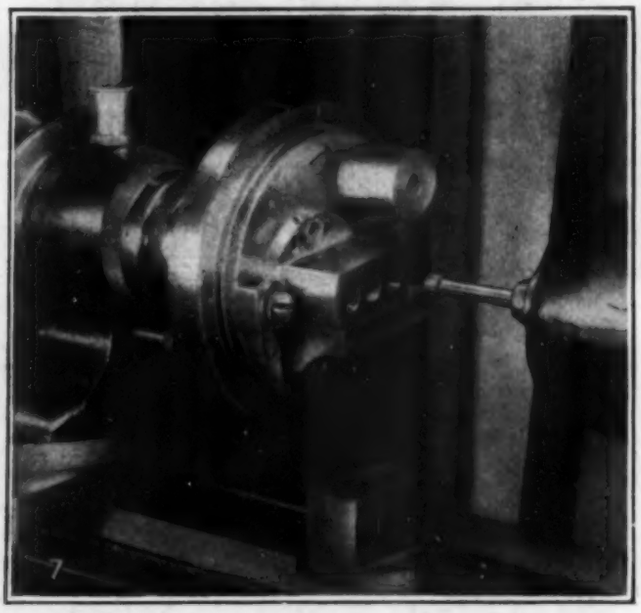


Fig. 6—Grinding the hole in the punch for the center bushing. Fig. 7—Grinding one of the outer holes in the punch

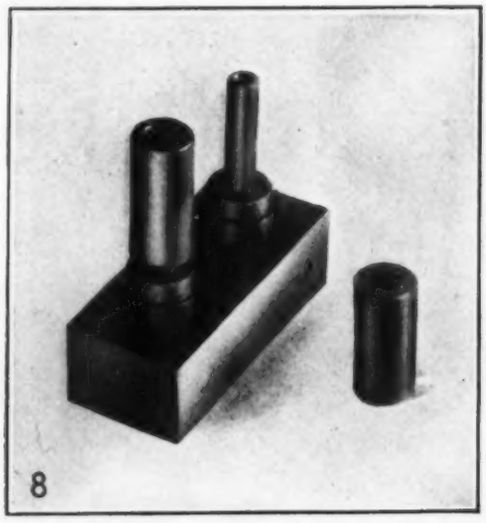
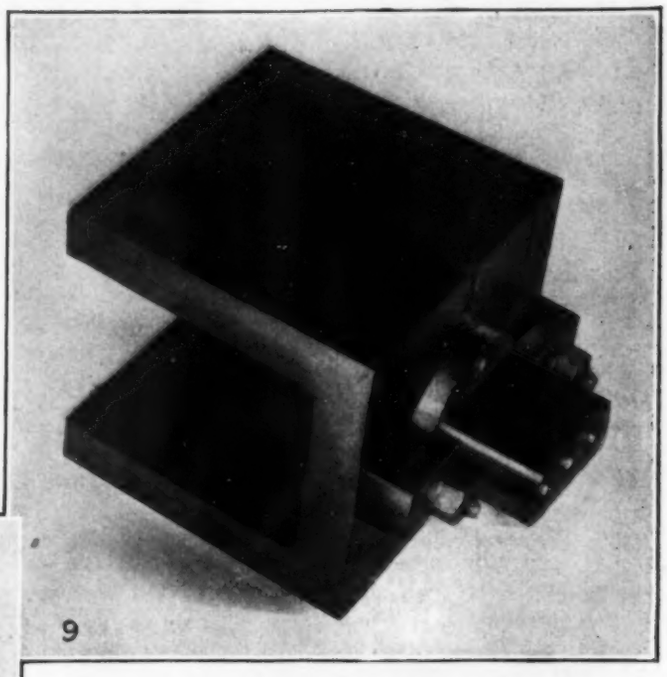


Fig. 8—Tool to hold the bushings while they are being forced to their seats

Fig. 9—For grinding the flats on the sides of the blanking punch, it is held in the fixture shown, where it is located by the flange



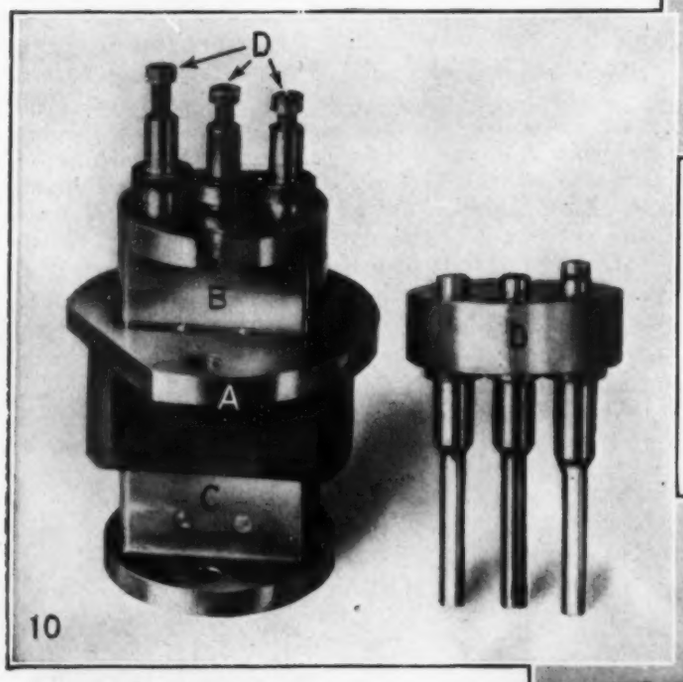
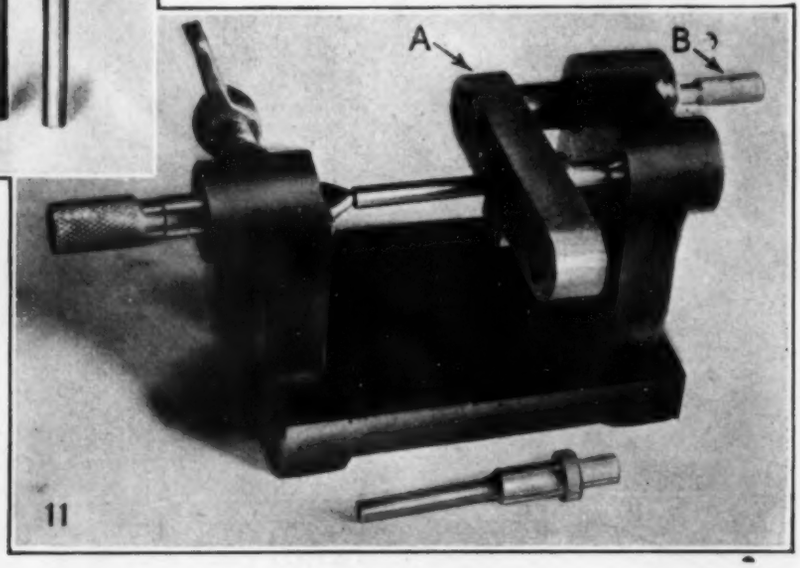


Fig. 10—A complete set of tools. At A is the die, at B the shedder, at C the blanking punch while at D are the piercing punches

Fig. 11—For grinding the flat sides on piercing punches they are placed singly on centers and held by the dog A and the pin B



closed by the bushings, are opened with suitable drills and reamers. The object of leaving one end of the bushings soft in the hardening operation is to have the metal at this point in condition to be cut by the drills, and a similar condition exists in the punch, since the cross-holes in the latter were above water when it was quenched.

The key-pins are now driven tightly in the cross-holes, dowelling in the bushings so that by no possibility can they turn or work out while the tools are in service.

The next operation is to grind the flat sides of the punch, for which job the fixture shown in Fig. 9 locates it by the flange. This fixture is symmetrical, and opposite flats are brought into parallelism by merely turning over the fixture on the magnetic chuck of the grinding machine without in any way disturbing the set-up. By frequent turnings and constant measurements over the flat sides with a micrometer, the punch is brought to size widthwise, and at the same time is made central with the flange.

The final operation is to grind a small radius at each of the four corners of the cutting contour where the straight lines of the flat sides break into the rounded ends. The fixture on which the punch is held for this work is quite similar to the one shown in Fig. 7, but it is used in a special machine that permits only a partial rotation of the work within fixed limits. The work holder is oscillated between these limits by a hand lever while the grinding wheel is fed to a stop on the cross-slide of the machine.

The shedders, one of which may be seen at *B* in Fig. 10, are very much like the punches, the principal difference being in the flange. Like the punch, it is made of water-hardening steel and finished all over by grinding.

The body of this part is a neat sliding fit in the opening of the die, which it fills completely. When in position, the outer end comes flush with the cutting face of the die, and when regrinding the latter, the shedder remains in place with its flange held firmly in contact with the back of the die by the pressure of the shedder spring in the plunger of the sub-press, so that the two surfaces are ground as one.

The Shedder and Its Action

When in action in the press, the shedder stops upon the surface of the strip of metal while the die continues its downward movement to cut out the blank. The cut-out blank enters the die for a distance equal to its own thickness (0.006 in.) plus two or three thousandths, thus causing a recession of the shedder (though the latter is for the moment stationary) against the pressure of its spring.

When the die starts to rise from the blanking punch, the shedder holds the cut blank against the face of the punch until the tools separate on the upward stroke of the press. While the blank does not at any time depart from the level at which it enters the tools as a part of the strip of stock, the stock is momentarily pushed downward by the die against the resistance of the spring under the circular stripper plate that surrounds the blanking punch, and is promptly restored by that spring and plate to its former level when the die rises.

The result is that the blank is accurately replaced in the stock from which it was cut, and when the strip of stock emerges from the tools it presents apparently the same smooth unbroken surface as when it entered. The vibration of the stock as it leaves the tools shakes out the blanks, or, failing to do so, they will be pushed out when the strip of stock is drawn tightly over the small-diameter guide roll on its way to the rewinding reel.

In addition to its function of pushing the blank out of the die, the shedder serves as a guide to the long and slender piercing punches, supporting them clear to the cutting edge. For this purpose it has three bushed holes corresponding in every respect to those in the blanking punch. There is no difference whatever in the two sets of bushings, and as here manufactured they are interchangeable—that is, the same set of bushings might go in either the punch or the shedder.

A full complement of cutting tools for a sub-press may be seen in Fig. 10, where the blanking punch *C* is shown as just entered in the die *A*, the shedder *B* entered above the die (when fully assembled it goes down until the flange contacts with the back of the die) and the three piercing punches *D* partly entered in the bushings of the shedder that guide them to the piercing dies in the face of the blanking punch.

A Nice Job of Grinding

Except for grinding the flat sides of the two outer piercing punches, their making involves no operations that are out of the ordinary, and no special tools or fixtures are required. It is merely an extra nice job of bench lathe and grinder work. They are made almost entirely on the bench lathe, and after hardening they are ground to size on a cylindrical grinding machine. A plus or minus limit of 0.0001 in. is maintained on all diameters.

To grind the flat sides of the piercing punch, it is placed on centers in the fixture shown by Fig. 11, the bar, or dog, *A*, is secured to the shoulder of the punch and the locking pin *B* is entered in the bushed hole at one end of the bar. The fixture is then placed on a magnetic chuck and one flat side of the punch is partly ground.

After taking a cut over one side of the punch, the locking pin *B* is withdrawn and the punch and bar are turned 180 deg., bringing the opposite bushing in position before the locking pin. Without disturbing the setting of the wheel, the second side is ground, and a measurement is then taken across the flat with a micrometer to show the operator how far down to set the grinding wheel to get the remainder. Owing to the unusually close limits imposed, it is necessary in practice to reverse the punch several times in order to prevent springing it with too heavy cuts and thus grinding it off center.

Making the plate to hold the piercing punches is a very nice job in itself, since it is hardened and ground all over—including the holes—by the same methods and with the aid of some of the same tools that are used to facilitate grinding the punches and shedders. The holes into which the separate punches are driven must align accurately with the guide bushings in the shedder. Though the punches are forced tightly in the holes, they are further secured by fillister-head screws entering from the back of the plate to prevent the possibility of their being pulled out when in operation.

The plate fits the recess in the plunger in which the flange of the shedder slides and is held securely to the bottom thereof by fillister-head screws. Two clearance holes in the punch plate permit the passage of the sliding pins by which the pressure of the coil spring in the cell above is transmitted to the flange of the shedder.

THE · FOREMAN'S · ROUND · TABLE

Arguing With the Big Boss

The following narrative is a "case" presentation of the topic. It has been written to involve some of the questions that arise in the average shop. For guidance in preparing discussion the questions at the foot of the page have been prepared

ED HAD been away visiting a few shops, one of them a railroad repair shop. There he ran across a case somewhat similar to the one where it didn't pay to use a jig. He was telling Al about it on the train—something like this—

"The Big Boss 'called' the foreman for planing the driving boxes one at a time instead of in pairs. Asked him what he thought they had big planers for, and was a bit sarcastic in spots."

"Did the foreman have a comeback, Ed?"

"I'll say he did, Al, and a good one, although it's always a matter of judgment. He said, 'Now listen, Mr. Boss, when we get these boxes from the lye vats you fit and apply new crown brasses, strip the old brass off the shoe and wedge faces, weld on new netting, pour on new shoe and wedge faces, and a new side wear surface.

" 'You know all our boxes are planed central so in setting up two boxes, one back of the other, we have to put sticks in both boxes, find the center of each one, and then set both centers the same height from the table. One box or the other has to be shimmed up and you're mighty apt to pull one down more than the other, in tightening. That means you have to loosen up the bolts, drive or pull out a shim, and try it all over again.

" 'If you have only one box you save a lot of set-up time, and I believe it's cheaper with a single pair of boxes.' "

"Looks like he might be right at that, Ed. It's hard to say off hand, not being familiar with his work."

"But is it wise to buck the boss, Al?"

"Depends on the boss, Ed. If he's a real boss who doesn't pretend to know it all, and really wants to save money for the firm, it does. If he's the kind who wants to have his own way regardless, why then it's safer to do work his way."

Was Al right about opposing the boss?

Or should a foreman follow instructions blindly when he feels that another method is best?

Should the foreman plan work uneconomically to justify the planer bought for the purpose?

All foremen are urged to discuss these questions. Acceptable letters will be paid for. The discussion is not limited to foremen, of course

Discussion of Earlier Topics

Is the Repetitive Operation to Be Avoided?

THE question of repetitive monotony concerns the first interests of the foreman. Every foreman seeking to advance himself has one or more men qualifying for the foreman's job. No foreman likes to be told that he is indispensable in his present capacity when the job higher up is open.

If the foreman is doing the right thing by himself he allows as little repetitive monotony as is possible in his department by teaching his employees the various operations of the department. It has been my experience that if a man strives for excellence on any single operation, he will appreciate relief from the monotony of it. If he is relieved of that monotony he will strive to excel in other work at his disposal. It helps keep him contented. It makes a man more ambitious to have a foreman take enough interest in his welfare to teach him the different operations. The newness of the work keeps the man's mind on it, and dreaming is discouraged. The results of the man's unconscious effort are the very results the foreman expects to be interpreted in the efficiency of the department. It has been my experience that this shifting about reduces spoiled work considerably. The man is more careful on the strange job and this apparent loss in production is made up in the reduction of spoiled work. Also by the careful training the man is taught to learn quickly, because he develops self-reliance. On the other hand, the repetitive operation worker on work that requires more than an ordinary amount of concentration seems to have more accidents. In one case coming to my attention the operator required medical attention on seven different occasions in two years.

—GEORGE E. HODGES.

I BELIEVE that the foreman should make a study of repetitive operations, because, despite the many generalizations that are written concerning the advantages. it is still to a great degree a problem of the individuals involved. There is undoubtedly a type of man who is perfectly contented with such a job, and who enjoys doing the same thing day in and day out, but the number of men falling in this classification is not as great as its exponents would lead one to believe. A man who has any ambition or imagination will go just so long, and due to the deadening effect of repetitive operations, he will express his dissatisfaction by "quitting."

The individual may not have had sufficient training or possess the necessary skill to do anything but a repetitive operation, but the same result can be accomplished by occasionally shifting him from one operation to another. I have often encountered men who have been on the same drill press operation for years, and who could literally perform that operation with their eyes shut, but in most cases they are always talking about "quitting one of these days," and it is obvious that such an attitude must affect their production.

—ALBERT HOERSH.

Which Kind of Man Is More Valuable?

I THINK a man or woman is molded by the foreman into the type of worker that may prove a success to his individual self, and a good asset to the shop and foreman. I have tried many ways in getting the best out of workers, and find the most successful is in getting them to think for themselves. I remember a workman once suggesting to his foreman an idea as an improved method. Looking the workman fully in the face he said, "Look here George, I am paid to do the thinking, and you are paid to do the work." George, being an ambitious individual, could see no prospect under such authority and cleared out. To get the best out of workers I find a most successful plan is to spend a little time with them at the commencement of the job, describing the blueprints, drawing, or pattern, as the case may be, together with the method suggested to achieve the desired result. The worker who has a fussy temperament, and is anxious to do his job well, will make no end of visits to his foreman, without any object of obtaining favor; others have the notion that by visiting the foreman often they may get something. These types are not the best for the shop. Neither is the one who works strictly to blueprints. The worker most valuable to the shop and foreman is that one who looks round the job in hand and applies his own common sense and ability after receiving the initial instructions from his foreman.

—GEORGE VICKERY, *England.*

WHEN a worker buzzes around his foreman we are pretty certain that he is interested in improving his position. This is a good sign, since it will enable the wise foreman to pick up and develop a good man, or find a worthless politician to fire. The man will betray his intentions by his own actions. It is up to the foreman to judge accurately by watching the results. Give a worker a foolish job to do and watch his reaction. If he obeys you blindly, he shows his inability to think much for himself, or his lack of courage to present his views. Such a man will not go very far beyond his present job. Some foremen are like frozen dummies, and hate to be questioned by their men. They hate explanations or the "whys" of things. Their policy is: "Do as you are told." The type of man who will

THE · NEXT · TOPIC

Getting New Blood in the Shop

QUESTIONS

Is it advisable to hire foremen from the outside?

Should it be necessary?

How does it affect the men in the shop?

help you increase your earnings is the nosey fellow who makes it his business to know what is going on above his job. —R. SENAY.

OF THE two types of men mentioned, the one who simply does what he is told is rarely encountered. I should consider the one who is inclined to be fussy and ask numerous questions the more valuable to any concern.

Being fussy over a job does not necessarily mean nosey, but rather points to an interest taken in the job. Although his output may appear to be less in comparison with the man who does not spend part of his time chasing the foreman and asking questions, it is more than likely that on the average his net output will be in advance in both quantity and quality, due to less time being taken up in rectification.

—S. A. BURBEY, *England.*

Who Should Go to the Storeroom?

CARRIGAN'S system of getting tools from the storeroom is a rather complicated one. It means that each man must have a pencil, a requisition pad, and a literary urge every time he needs something. Moreover, if the wrong tool is delivered the man who ordered it won't know about it until he is ready to use it, which means more time lost getting the right one. Secondly, requested tools lie around waiting to be used while someone else may be waiting for these tools.

At our plant the workmen present checks at the toolcrib for tools, and they get what they want. All the necessary parts are furnished with each job when it is let out, so that there is no need for shopmen to fill out requisition blanks. —SAMUEL KAUFFMAN.

A GOOD plan for production as well as for toolroom work is to establish a tool and supply crib for each department. In production work the crib should take care of 200 to 500 men, and in toolroom work should take care of 50 to 75 men. The toolcrib should be out of the jurisdiction of the foremen of these departments. They should have a budget stating the sizes and order number of all parts needed. The toolcrib is then equipped with a surplus of every needed tool or replaceable part. The toolcrib must have two or more men, one to run errands in case of necessity for tools or replacements. In this way the production operator is kept at his machine, and the toolroom help does the running.

—JACK L. MORGAN.

A SYSTEM that makes it unnecessary for high-class mechanics or other employees to go to the storehouse, oil house or material sheds for supplies, has recently been established in one of the largest railroad shops in Chicago.

The plant has been divided into three zones, and within these zones, comprising the machine shop, boiler shop, tin shop, carpenter shop, tank shop, planing mill, oil house, iron sheds, and two storehouses, are 46 service stations. These stations are designated by large circular signs, stenciled on pillars and numbered from 100 to 300. Each foreman's desk is a service station, and written orders for material to be delivered are placed on hooks at these points.

Each of the zones has a messenger boy, under the jurisdiction of the general storekeeper, who makes 12 or 14 trips daily to each station, collects all orders and delivers all small material in push carts. All heavy materials and castings are delivered by electric tractors, operated by colored laborers. No employees, except foremen, are allowed to go to the storehouses for material, only in extreme emergency cases.

—FRANK J. ROBERTS, *Foreman.*

I HAVE supervised where both systems of tool delivery have been tried out, stores delivery and letting the men run here and there around the shops and stores for materials needed. In some instances a man would make several trips to obtain necessary materials to complete a job when this material could have been brought by one trip. The foreman cannot keep his men under observation when such things are allowed.

Let the foreman anticipate the wants of the men ahead of time. This system teaches him to look forward, and also teaches constructive leadership. Output can be increased in his department by using the delivery system. It is not an advisable plan to hire cheap labor to deliver the tools and material. Mixed orders and wrong deliveries create confusing difficulties and delays. Remarkable results can be obtained by placing requisition boxes, or stations, in each department.

—A. SILBEE, *Gang Foreman.*

CARRIGAN'S scheme ought to work well in any shop, but to my mind it is most suitable to the semi-production shop. Quite often a signal system can be worked out, whereby the operator puts up a colored steel flag when in need of tools or additional parts. Such a signal can be arranged within reach, and as long as certain operators will be in need of a limited number of tools only, the signals can be very simple and few. In certain cases one general call sign would be enough to bring the foreman or the runner to find out what is needed. Whenever possible the operator should have a spare tool, and the minute he puts that in use he should flag for a new spare, so that he will always be ready for emergency.

Naturally the less running about, and the more automatically things are taken care of, the more efficient will be the foreman. In any well-regulated production shop operations are laid out before hand, and the operator already has his tools, needing replacements only.

—J. C. P. BODE.

How Do Mutual Aid Societies Help?

IN OUR shop we formed a mutual aid association amongst our employees, which works very satisfactorily. We have about 85 members. The reserve fund is kept at $150.00 at all times. The dues are $1.00 per month, and the benefit is $15.00 per week for two weeks. When there is no sickness, and we have our $150.00 in the fund, the dues are not collected until we need cash again. We also take from this fund money to buy flowers in case of the death of a member or one of his family.

This association does away with the annoying habit of going around with a list every time anyone gets sick. Of course where there are many employees, a group benefit plan put out by a good insurance company is perhaps the best way to take care of sickness in case of an epidemic. —CARL H. ANDERSON, *General Foreman.*

Taking Care of the Old Men

ASSUMING that the old men have merited consideration by their past services, I would say it was highly unreasonable to let them go. Such treatment is not at all conducive to building up that essential morale so necessary in industry. If the company does not consider the man's future, how can it expect him to respect their's?

Pensions are far from ideal for the workman. For the man who is a technical expert pensions often provide a sufficiently steady income to permit him to pursue some research or special activity to which he can lend the mature years of his experience. But this hardly applies to the workman in mechanical lines. If he is suddenly pensioned off he does not know what to do with his time, and his relegation to the scrap heap hurts him deeply, and in some instances may lead to his premature death due to worrying about what to do with the unaccustomed leisure on his hands.

—WM. H. HOAGLAND, JR.

THE old men should be taken care of as they have helped to build up the plant. New methods are considered from time to time, and the old-timer can generally give advice as there might have been similar methods tried in years past.

These old-timers are authorities; they have seen foremen, superintendents, and managers come and go. Their knowledge is invaluable to companies who have no detailed records of the manufacturing processes of the past. In salvage work their judgment is good due to their many years of experience in the manufacturing of the product.

In many shops it is an honor to be selected for the salvage inspector, and it would suit the old-timers well. Old-timers with ratings as good mechanics would feel disgraced by taking a sweeper's or a night watchman's job.

—BENJ. C. THOMAS.

Shop Visiting for the Foreman

MOST ordinary human beings, regardless of their calling in life, enjoy an occasional break in the routine of their daily lives, and the foreman is no exception to this. When Ed gets back on the job from shop visiting he will have a broader outlook and a better understanding of his own job, and more zeal and enthusiasm to tackle his daily problems. Moreover, if he has learned of any methods or processes that are better than the ones he is using, he will not hesitate to recommend adopting them.

—J. M. CANNING.

THE benefit reaped from a visit to another factory by a foreman is analogous to that gained by executives attending a convention. As a rule when foremen visit factories they are quick to compare tools and methods of their own department to those they see at the visited plants. If the particular method happens to be superior to the one used at their own establishment a mental or written note is taken and the company benefits by the suggestion.

The visits also help to stimulate the foreman's interest in his work, and it also checks the foreman on whether or not he is keeping up to the times in his own particular line of work. If the foreman comes back with only one suggestion it will usually pay the expenses of the trip.

—JOSEPH J. FERRY.

Who Should Do the Discharging?

ON ACCOUNT of high cost of labor turnover, making of scrap and slowing down production, a discharge should be the last resort. After a foreman has done his best to put a new man on a job that will be to the best advantage, and finds him unsatisfactory, he should take the matter up with the employment manager. Together they should analyze the man as to his qualifications and ability. After careful consideration, and they both agree that the man is not suitable for the particular business the company is engaged in, it is best for all concerned that he be let go.

Should the foreman of the other department be agreeable to give the man a trial a transfer should be arranged. It is a case of where two or three heads are better than one in the matter of this kind. In the first place great care should be taken in the selection of the right type of man for the job at the employment office so that the necessity of discharge may be reduced to a minimum.

—J. A. MCCARTHY, *Production Manager.*

The Practical Joker

I USED to be a joker, but was cured of this shop evil, I am glad to say, at an early date. We had an apprentice boy about 17 years of age. After the planer was set up full of plates, Johnny would have a long time to loaf, so he did this by planting himself on a nail keg against a post and going to sleep. The Boss came down one day with a fire cracker about a foot long, and told me to get back early from lunch and get this nailed properly inside the keg, with the fuse within easy reach in back.

That afternoon Johnny got a newspaper and immediately made a dive for the keg. I sneaked up and made the light. Johnny and the nail keg went up in the air and dropped with a crash. We waited for Johnny to get up and cuss, but he did not. We called a doctor, but it took half an hour to bring him to. Then he told us that he had just got to the place in the paper where the executioner closed the switch to electrocute a man, and he thought he was going with him to eternity. Never again!

—F. C. MASON.

Do We Buy Labor or Production?

THE fundamental idea in business is to buy production. But there are many other factors involved. Fairness, good working conditions, and morale, also fit in, though the human element is too varied for any employer to expect that all employees will bring an equal return on the investment.

A man's moral influence on the group in which he works, plus his actual production, may make him an unusually good investment for his employer. Employers generally recognize that it is profitable for them to provide suitable light, heat, ventilation and sanitation, thus affording pleasant working conditions for all. Yet unquestionably all do not appreciate such things or respond to the same extent.

—JOHN MARK MAY.

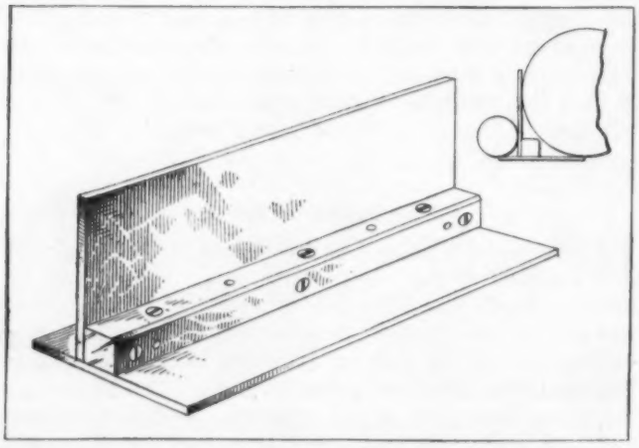
Ideas from Practical Men

The department, "Ideas from Practical Men," is devoted to the exchange of information on methods useful to the machinery industries. Its scope includes all divisions of the metal-working industry, from drafting room to shipping platform. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for. The rates are from five dollars upward, according to their merit

An Improved Keyseat Rule

By H. L. Wheeler

A keyseat rule made as shown in the illustration, is considerable of an improvement over the conventional types to be found on the market. This rule has an additional edge that permits its use in scribing keyways on



Keyseat rule for large and small shafts

shafts less than ½ in. in diameter, while the opposite edge is adaptable for the larger diameters.

Such a rule can be made of ground templet-stock ⅛x1½ in., and can be of any length desired. Two pieces of equal length should be assembled to a piece of ⅛-in. key stock by machine screws and dowels, as shown. The edges should be square and parallel.

Automatic Link and Link-Block Grinder

By J. Monroe

The automatic link and link-block grinder illustrated in Figs. 1 and 2 is in use in the Delta, Wash., shops of the Great Northern Ry., where it was designed and built.

Power is supplied by an electric motor which is belted to a 2-speed reduction gear with ratios of 1 to 4 and 1 to 16. The reduction gear drives a shaft on which the crank disk that reciprocates the link or block is mounted. A connecting rod, adjustable as to length, is the connection between the crank and the link-carrier, or pendulum, which is a screw 2 in. in diameter with four square threads per inch. A weight is supplied to counterbalance the weight of the link.

From the driving motor a second belt runs over an idler to the wheel spindle. A 3x½-in. wheel is used. There is a ratchet rod driven by the crank shaft to operate a gear train by which is secured the in and out motion of the wheel, the length of travel of the wheel being controlled by an adjustable crank. Feed, for depth of cut, is brought about through a vertical screw that extends the length of the column, passing through a nut in the pendulum-screw slide. A link, not shown in the illustration, is given a reciprocating motion to feed at the rate of 0.001 in. at the end of each rear, or in, stroke of the wheel. A dog on the feed wheel is set to trip the feed when the desired depth has been reached. For vertical adjustment of the link with respect to the wheel, the spur gear and

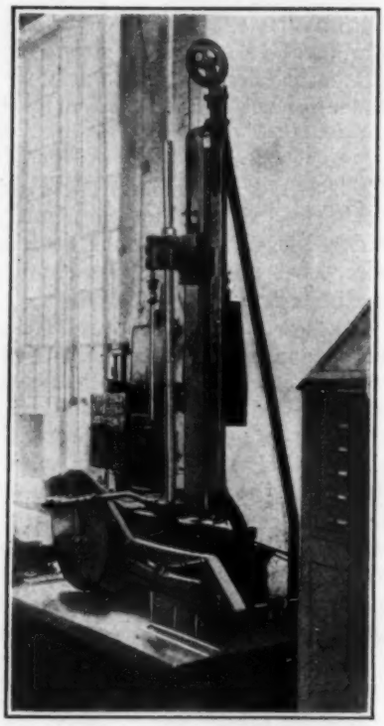


Fig. 1—Automatic link and link-block grinding machine

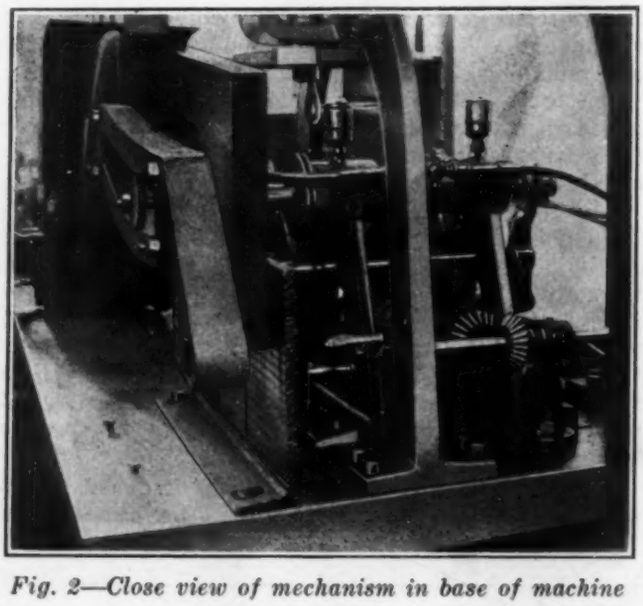


Fig. 2—Close view of mechanism in base of machine

pinion on the pendulum-screw slide and the long handle with knuckle joint are supplied.

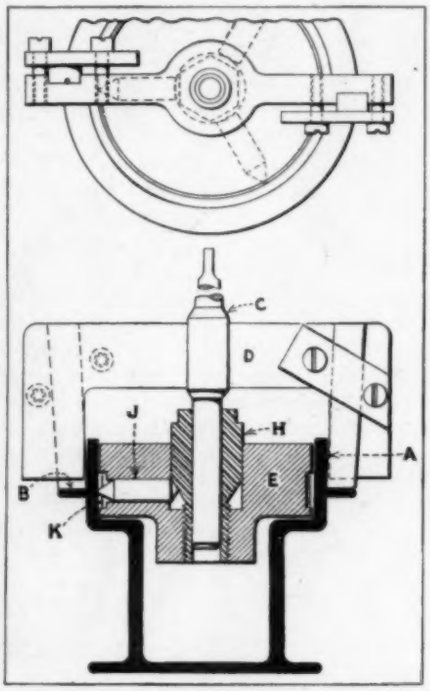
Links of radii from 20 to 74 in. can be ground on the machine, by changing the point of suspension to suit the radius.

Turning and Facing in the Drill Press

By H. White

We have to machine a large quantity of castings such as shown in heavy lines in the sketch. Since our lathes were all tied up we decided to do the work in the drill press. The parts to be machined were the outer diameter *A* and the face of the flange *B*.

The tool designed to do the work, and which was used successfully, is shown in the accompanying sketch. It consists of the shank *C* fitted to the machine spindle and terminating in a pilot at the lower end; the yoke *D* clamped to the shank and carrying two high-speed toolbits; the centering spider *E*; and the bushing *H*, to act as a bearing for the pilot. The seats for the toolbit were cut at an angle to provide for adjustment of the tools, which were held in place by clamps, as shown. The centering spider is a cast-iron block carrying three radially disposed rods as at *J*, and is threaded at the lower end to receive the bushing *H*. When the bushing is screwed in, the conical part just above the thread bears on the heels of the pins, and forces them outward, centering the spider. The pins are prevented from falling out by the steel band *K*, which has holes drilled in it of a size that will allow the points, but not the bodies, of the pins to pass through.



A turning and facing tool for the drill press

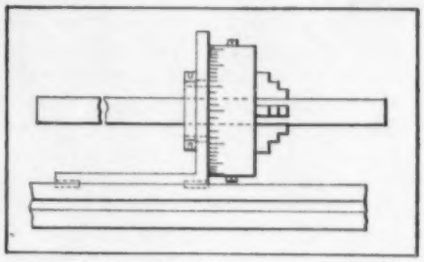
Locating Keyways at Definite Angles

By Charles Kugler

Noting the article Drivers for Index Centers, by Robert Julian, published on page 998, Vol. 65 of the *American Machinist*, I believe the readers will be interested in a fixture I made some years ago to accomplish a similar purpose.

A universal chuck of suitable size was first mounted upon the dividing head of a milling machine and graduated in degrees as shown in the sketch herewith. An angle plate is fitted with ribs on the bottom to match the slot of the milling machine table and a hole is bored in its face to take the hub of the chuck collar.

The hub is made a good running fit in the hole of the angle plate and an external thread is cut upon its outer end, to which a ring nut is fitted. This method provides a means of securing the chuck in position, at the same time permitting it to be revolved by loosening the nut. A witness, or zero, mark at any convenient place on the face of the angle plate provides the starting point for setting the chuck at any desired angle from a given position.



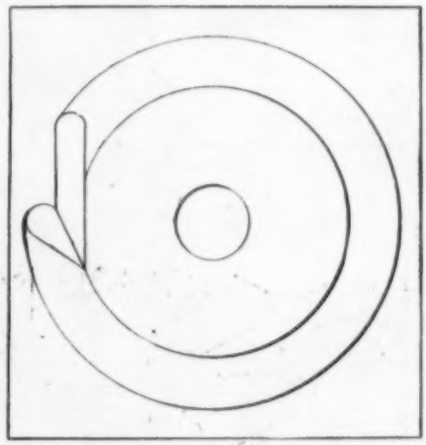
An indexing fixture to hold shafts for splining

When possible to do so, I use the vise of the milling machine in connection with this fixture to hold the work more rigidly, in which case the chuck serves merely to establish the angular relation of the second keyway, while the vise resists the pressure of the cut.

Gashing Circular Formed Tools —Discussion

By Charles Horne

The articles under the title given above by H. B. Schell and David G. Kallstrom, and published on pages 843 and 1074, Vol. 65 of the *American Machinist* were of great interest to me, but neither of them mentioned one important advantage to be gained by grinding the gash after the tool has been hardened. This advantage is that the tool can be polished after hardening, and in many cases, the expensive operation of grinding to form can be eliminated. At one time it was my job to make circular form tools as shown in the sketch to cut grooves in ball-bearing races. Since cutting edge had to have an angle of 6 deg. it was necessary to make the actual faces slightly elliptical instead of circular. By grinding the gashes in these tools after they were hardened we found it practicable to do away with the form grinding operation entirely and finish the form by polishing.



Form tool with ground gash

If the gashes are milled before hardening the tools cannot be polished properly and for this reason alone many are form ground that would not otherwise require this operation.

Hexagonal Division of Isometric Ellipse

By Henry Simon

A difficulty frequently encountered in isometric drawing is that of properly representing a polygon in relation to a circular surface, which in the isometric will appear as an ellipse. By far the greater number of such instances are made up of work where a hexagon must be shown either inscribed in or circumscribed about a circle due to the prevalent use of hexagon stock for turned parts. Nothing will more quickly spoil the appearance of an otherwise good drawing, for instance, that a poorly drawn hexagonal nut, and nothing is more quickly noted than such a defect.

In the accompanying illustrations are shown methods of effecting the hexagonal division both of the conventional ellipse in common use and of the form proposed by the writer in an article on page 414, Vol. 65, of the *American Machinist*. These methods, which apply to the inscribed as well as to the circumscribed hexagon, have in common the fact that a single element already contained in the ellipse construction is used in finding the subdivision, and all remaining parts of the figure follow from this "starter."

In Fig. 1 is shown a hexagon inscribed in the conventional ellipse in the two positions in which it is likely to appear in the drawing. The side *DC* of the central parallelogram *ABCD* formed in the original isometric parallelogram as a result of the necessary construction lines is used as the starter. *P* and *V* are the starting points, and *T* is the intersection of the major arc of the ellipse with an arc equal to *DC* drawn from *V* as a center. Similarly, *PX*, is equal to *DC*. The lines *PS* and *WX* are vertical. The lines *VW* and *PS* are drawn to close the polygon.

It will be noted that in both cases a fair representation of the end of the hexagon bar is obtained. As pointed out in the article referred to, it is quite impossible to inscribe any polygon into this conventional ellipse with any degree of logic, because of the inherent weakness in its construction whereby it has major and minor axes not proportional to the diagonals of the parallelogram in which the ellipse is inscribed.

In Fig. 2 is shown a hexagon inscribed in the form of conventional ellipse proposed by the writer. As can be seen, the construction is very simple, and at the same time the hexagon is properly centered upon the parallelogram and the distortion generally is so slight as not to be noticeable. The points of tangency of the circumscribed parallelogram are the starting points. It is merely necessary to draw *AB* and *ED* horizontal in the upper figure and at 30 deg. to the vertical in the lower figure. The line *BC* and *EH* are drawn at right angles to these respective lines. The polygon may then be closed.

A different method of dividing the new ellipse, and one in which all elements that should be parallel *are* parallel, is shown in Fig. 3. It will be seen that not only all pairs of sides, but all corner connecting lines that should be parallel to each other are so. This division is obtained by drawing *EC* and *HB* through the foci of the ellipse at 30 deg. to the horizontal in the upper figure and vertical in the lower figure. Points *A* and *D* are already established through the construction of the ellipse, so that it is only necessary to connect up the polygon. This construction is useful in certain classes of work, as, for instance, where the ends of the hexagonal part must be shown slotted or slabbed. Otherwise, this construction is not as good as Fig. 2, which is to be preferred for all ordinary work.

In Fig. 4 is shown the circumscribed hexagon for the conventional ellipse, and in Fig. 5 that for the improved

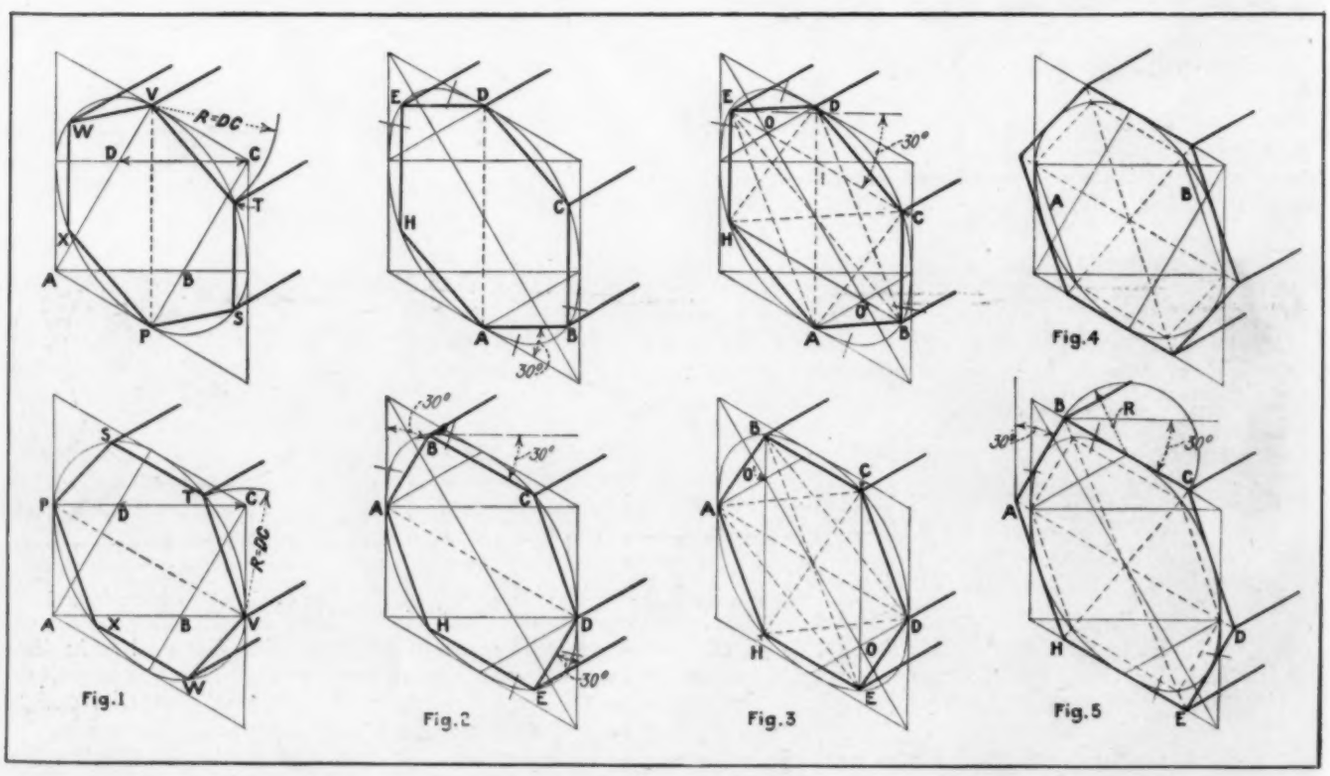


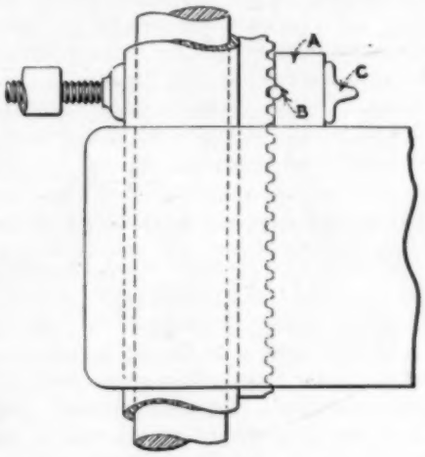
Fig. 1—Hexagon inscribed in the conventional ellipse. Fig. 2—Hexagon inscribed in an improved ellipse. Fig. 3—Method for obtaining parallel hexagon elements. Fig. 4—Hexagon circumscribed about the conventional ellipse. Fig. 5—Hexagon circumscribed about the improved ellipse

ellipse. In Fig. 4 it is first necessary to draw as starters lines *A* and *B*, determined as in the case of the internal hexagon. In Fig. 5 the distance *R* from the common point of the major and minor arcs to *B* is used to locate point *C*. Point *B* is located at the intersection of lines *AB* and *BC* drawn 30 deg. from the vertical and the horizontal, respectively. Points *H*, *E* and *D* are similarly established. In either case it should be noted that the circumscribed and inscribed hexagons are a good match.

Positive Stop for a Drill Spindle

By Chester H. Franklin

It often happens that we want to drill several holes to a given depth, or even to measure the depth of one hole without cleaning out the hole and sticking a rule, or rod down to measure it. So we use a stop on the drill spindle. Some use screw, or block, stops under a collar. But collars are not always available and split collars have a way of slipping at times. A friend of mine used the simple device illustrated. He takes a block of soft steel, *A*, and files a V-notch as at *B*, a little to one side of the center so as to "split" a tooth space of the rack, by reversing the block. A pin in the V-notch and in any of the rack teeth gives almost any desired depth. The clamp *C* holds the block against the feed rack, the pin at *B* preventing slippage even when the spindle is brought down quickly and stopped suddenly by the stop striking the bracket.



A simple spindle stop

Reaming Allowances for Pierced Holes

By Louis L. Locke

Pierced holes in sheet metal are accurate to a certain extent, but on account of variations in the metal and the wear of the punches and dies, it is necessary often to refinish the hole to maintain a definite size. Shaving or re-piercing sometimes follows the piercing operation, by which it is possible to maintain still greater accuracy. However, when the metal shaved is thick, it will break through at the bottom, leaving a ragged or rough face. To prevent this condition, reaming is generally resorted to.

Proper stock allowances for reamed holes must be such that the holes will clean up, otherwise the advantages of the additional operation will be lost. Allowances that will permit a satisfactory finish for practically all kinds of metals in various thicknesses are as follows:

For holes from $\frac{1}{16}$ to $\frac{3}{4}$ in., 0.008 in., and from $\frac{3}{4}$ to 1 in., 0.010 inch.

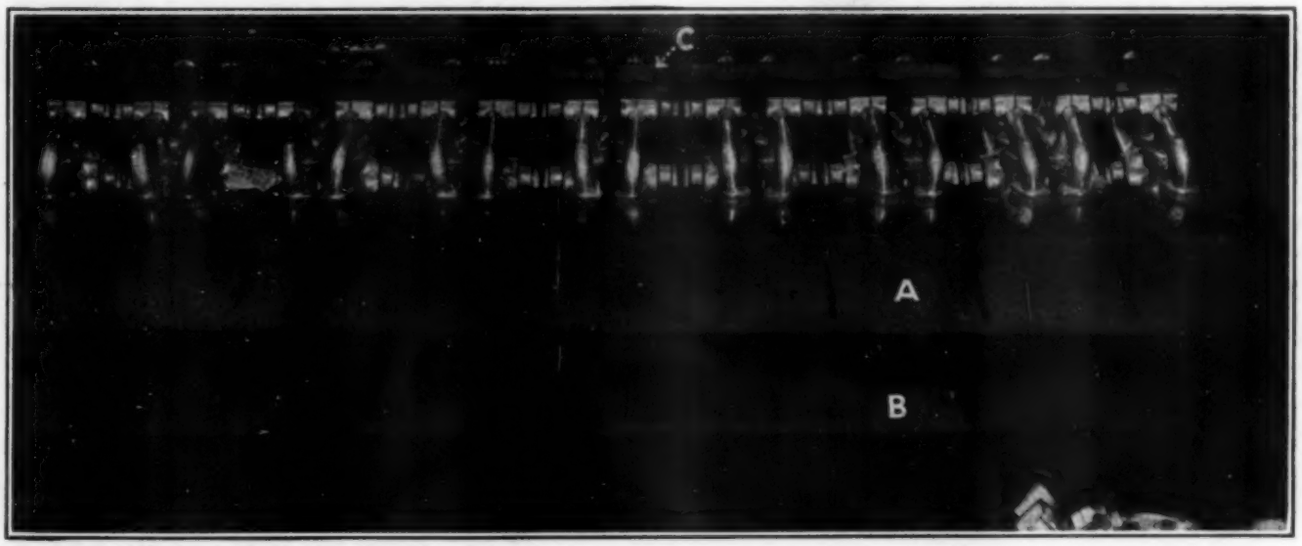
A Tumbling Rack for Cored Work

By Clifford H. French

Tumbling formerly meant putting work into some kind of a barrel or drum and revolving it, usually accompanied by hideous noises. Cored work did not stand much of a chance, except of being battered on the outside.

Aluminum castings demanded another type of treatment, and there have been many cases of "outside" tumbling in which odd-shaped or broken pieces were put inside and the castings revolved. The machine shown is used in the Pierce-Arrow shop for cleaning manifolds and other cored pieces of aluminum.

The tumbler consists of several wings, as at *A* and *B*, mounted on a shaft that revolves in end bearings. The manifolds are mounted in pairs and are held in place by the long strip *C*, by bolts that go through the slots in the wings. The shot or stars inside the manifolds work around in both of the pieces.

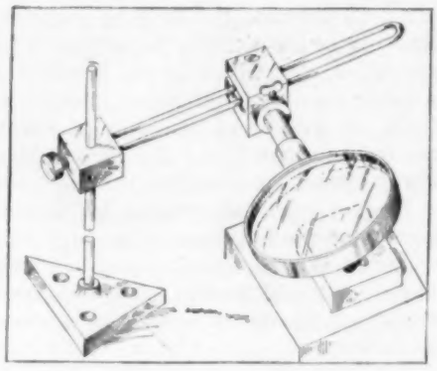


Tumbler for cored aluminum work

A Stand for a Magnifying Glass

By H. L. Wheeler

A large magnifying glass is a great aid to tool and diemakers when laying out work, but it is rather inconvenient when it is necessary to hold it in the hand. The sketch shows a simple mounting for such a glass, by which its advantages are made available while leaving both hands of the workman free. The standard can be made from material easily obtainable in any tool or die shop. For the base any suitable casting may be used, or even an old die block. The standard is a piece of round cold-rolled steel or drill rod, a $\frac{7}{16}$-in. rod being a convenient size. The sliding parts will have to be made specially for the purpose but the construction is simple and is fully shown by the sketch. A single horizontal rod may be substituted for the loop of $\frac{3}{16}$-in. wire here shown, and will have the advantage of allowing angular adjustment of the glass.



Stand for magnifying glass

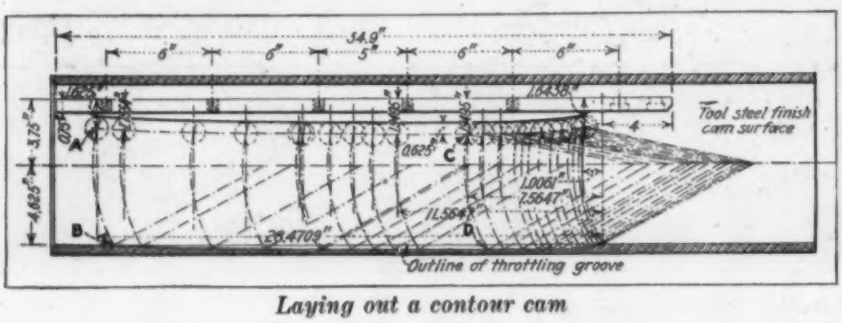
Laying-Out a Variable Cam

By R. E. Marks

Laying out cams isn't much of a job if you go at it right. But it takes patience and you have to know how to start. First of all, don't forget that the diameter of the follower rolls must be considered. I once had to check up on a very expensive mistake that occurred because the draftsman had laid out a cam from the center of the roller instead of from the outside.

The cam shown is for cutting the throttling gas groove in a large gun. The groove itself is shown at the bottom of the illustration, while above is the cam laid out by having the *outside* of the rolls follow the path shown above.

The arc *AB* shows the relations of the cutting tool to the cam above, since the head carrying both the roller and the tool, swings on a pin that forms the triangle shown at the right. The dotted lines show how the cam is laid out, rollers being drawn to give the correct path for the cam above. The dimensions show the changes in the contour.



Laying out a contour cam

Practical Shop Problems

Questions of a Practical Nature will be answered in this column

Tap Specifications

Q. What is the meaning of "2 pitch, double thread?" Most taps so specified gage 4 th. per in., but one time we received a tap with 2 th. per in. which I think is correct according to the above specification.

A. You are likely to get anything when using such an ambiguous and misleading specification. Taps marked thus and measuring 4 th. per in. are correctly known as $\frac{1}{2}$-in. lead, double-thread taps. The *pitch* is $\frac{1}{4}$ in., as by definition of the National Screw Thread Commission, the pitch is the *distance*, usually in inches, from a point on a screw thread to a corresponding point on the next screw thread measured parallel to the axis. The lead on the other hand is the distance a screw thread advances axially in one turn, and on a double-threaded screw or tap the lead is therefore twice the pitch. In the example cited the tap that gaged only 2 th. per in. is correctly designated as a $\frac{1}{2}$-in. pitch, single-thread tap.

Dimensions of Oil-Well Casing Threads

Q. Will the formula used on standard pipe threads for figuring the pitch diameter of the thread at the end of the pipe also apply to oil-well casing thread?

A. Since the pipe thread formula is based on a taper of $\frac{3}{4}$ in. per foot, and a given length of thread, it cannot be applied to casing thread. Tapers of $\frac{7}{16}$, $\frac{3}{8}$, and $\frac{3}{4}$ in. per ft. are used on oil-well casings, and the length of thread is not in the same proportion as for pipe threads. You will find tables giving dimensions of casing threads in the standard handbooks.

Modulus of Elasticity

Q. What is the modulus of elasticity, and how does it differ from the coefficient of elasticity?

A. The two terms are used to mean the same thing. The elasticity of a material is its property of regaining its original form when the forces are removed. The elongation of a bar subjected to a pulling force is approximately proportional to the force up to a certain limit, called the elastic limit. The modulus of elasticity, or coefficient of elasticity, is the number obtained by dividing the stress per unit of cross-sectional area by the increase in unit of length. It is customary to take the area in square inches, the stress in pounds, and the increase in length per inch of the bar. Thus a force of 30,000 lb. acting upon a piece of steel 1 sq.in. in section will stretch it 0.001 in. The modulus of elasticity is therefore 30,000 lb. divided by 0.001 in., or 30,000,000 lb. per in. Another way of looking at this figure would be to say that a force of 30,000,000 lb. would stretch a piece of steel 1 in. long to 2 in., that is, double its length, provided the piece would not break and the ratio of force to stretch remained constant.

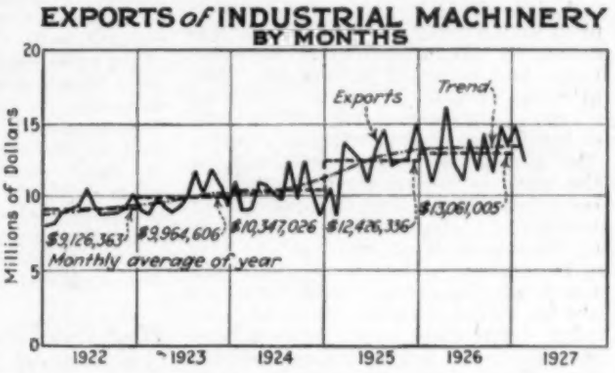
Activity in the Metal Working Industries

Production Operations On Slightly Lower Basis

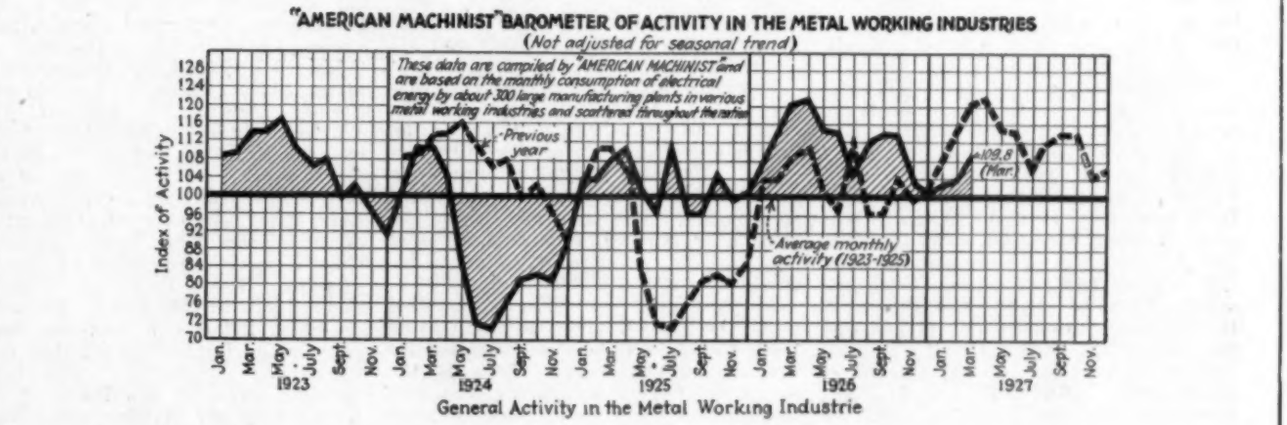
The first quarter of the year closed with the productive operations of the metal working plants at a high rate of activity, but on a plane about 9 per cent under the near-record operations reported for March of last year. Ever since the opening of the year the operations of these plants have been below those of the same months of 1926. The operating figures, which are based upon the monthly consumption of electrical energy by these plants, indicate, therefore, that the metal working industry as a whole is in a prosperous condition, but that the record operations reported during 1926 are not likely to be reached during the present year.

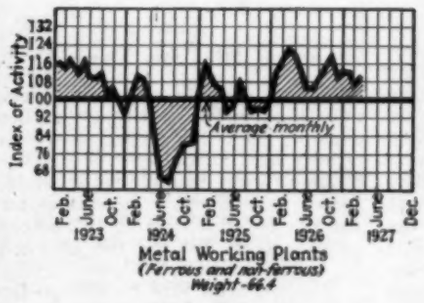
Both the metal working plants and the automobile factories recorded slightly increased productive operations during March, due to the greater number of working days, though the activity in the metal working plants was slightly under that of February. Incomplete returns indicate that the rate of automobile production during March was about 1 per cent above that of February.

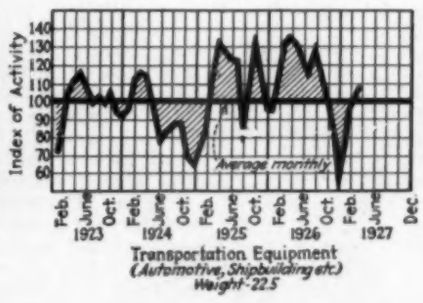
This recession in operations from those of last year in the metal working industry is reflected in the operations of industry as a whole. General industrial production during January and February was about 6 per cent below that recorded during the same months of last year. Incomplete returns for

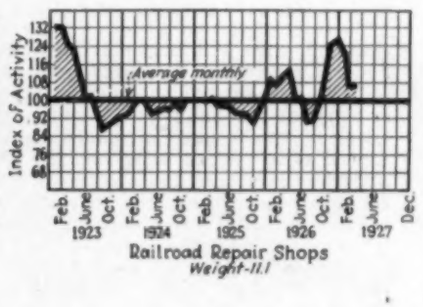


March indicate that the operations during that month were also lower than those of last year. The accompanying charts showing industrial activity are based upon electrical energy consumption data as collected by the *Electrical World*. Reports on the export movement of machinery, as furnished by the Department of Commerce, indicate a decline in exports for the month of February as compared with January, but an increase of $1,225,000 as compared with the corresponding month of last year. A total of $12,275,000 worth of industrial machinery, including $1,295,000 worth of metal working machines, was exported in February.


"AMERICAN MACHINIST" BAROMETER OF ACTIVITY IN THE METAL WORKING INDUSTRIES
(Not adjusted for seasonal trend)
These data are compiled by "AMERICAN MACHINIST" and are based on the monthly consumption of electrical energy by about 300 large manufacturing plants in various metal working industries and scattered throughout the nation
Index of Activity
Previous year
109.8 (Mar.)
Average monthly activity (1923-1925)
1923
1924
1925
1926
1927
General Activity in the Metal Working Industries







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Technical Abstracts

Glass Guards for Machines

A non-splintering glass has been applied in Germany as shielding on machines for the protection of workmen from hot chips or fragments from grinding wheels. The glass is built up of two clear glass plates with a sheet of highly transparent celluloid between. The plates are smooth surfaced, and the whole is pressed together mechanically in such a manner that no air bubbles are left, and little or no trace of the cement is apparent.

The glass, which goes under the name of Kinonglas, will withstand sharp blows without breaking, and when deliberately struck with a hammer will break locally without splintering. Small sheets are placed in front of the guards on grinding wheels so that complete protection of the eyes is given without impairing visability. For milling machines or lathes the plates are mounted on aluminum or light metal frames with shapes conforming to the requirements of the job.—*Die Werkzeugmaschine*, Germany, Jan. 30.

The Supply of Fuel for Oil Engines

It would be a misfortune for the country if users of oil engines or prospective users were alarmed by the sensational headlines giving the impression that there would soon be a grave shortage of oil. The future supply of oil is an entirely different matter from the supply of coal, iron, or other mineral resources. The amount of oil actually in sight at any one time is relatively small, compared to the rate of consumption, but this condition is no reason whatever for concluding that the oil supply will soon run out. The experience of the past has shown that whenever more oil is needed, new oil fields have been located. When plenty of oil is being produced, as is the case just now, there is no economic reason for seeking new oil pools. Still another source of oil for the future is the by-product distillation of coal and the distillation of oil shale. Though the use of coal in this way is still in its infancy, 146,000,000 gal. of light oils were produced in 1925, which in itself is enough to supply about one-half of the oil engines in the country.

A study of the oil situation indicates that the price will rise a little farther but not much, and the final price will still be low enough to make it highly economical for use in oil engines. In favor of the modern oil engine is the fact that it uses so little fuel per unit of power developed that a moderate increase in the price of the fuel does not materially affect the cost of power. The reason why the price of fuel oil will not advance much more is that at present about one-half of all the oil produced by the wells is burned in the form of fuel oil in furnaces where, if necessary, coal or gas could be satisfactorily substituted. The best estimates obtainable indicate that the total horsepower of oil engines in this country, both stationary and marine, is about 2,000,000 hp., including Diesel and semi-Diesel, and the annual fuel consumption is about 350,000,000 gal. This amount is only 2½ per cent of the fuel oil that was marketed in 1925. It is clear, therefore, that oil-engine users will always be able to obtain plenty of fuel at a moderate price even when the number of engines in use has greatly increased.—Edgar J. Kates, in *Power*, March 29, 1927.

How Hand-to-Mouth Buying Affects Steel Costs

Hand-to-mouth buying, or what might be called provident buying, has affected costs of steel production in an upward direction to such an extent that those who devote their principal attention to economics and costs in steel plants have begun to give serious consideration to this new situation.

Small lot buying was more pronounced in 1926 than ever before. After the depression of 1921 many buyers resolved that they were going to solve the problem by keeping their inventories down and maintaining a more liquid position. We enjoyed during the year 1926 the largest aggregate demand for steel products that this country ever experienced, but this great demand was made up largely of small orders, and we were handicapped many times by the inability of our clerical forces to handle so many orders.

Placing of orders was frequently delayed until the stock was actually needed. Mill schedules could seldom be completed by as much as a week in advance. Moreover actual rollings of a particular section were in many instances much less than the life of the roll, necessitating roll changes and loss of time, which contributed to increased costs in the steel plant.

Millions have been spent by the steel mills to effect economies as small as 50 cents a ton, but these economics have been wiped out several times by the character of the orders that steel plants were called upon to produce in 1926. The jobber or distributor has been able to profit by the new situation, and to some extent his economies have been passed along to the consumer. But the steel mill, because of the necessity of handling so many small lots, has partly taken the place of the distributor without profiting from such service. The steel maker must stock his ore, coal, and other items months ahead, especially in advance of the Winter. The present absence of forward buying gives the impression of a weak market, and it is difficult to attempt to relate this inventory to the character of the orders as they come to the mill for production. —Walter C. Carroll, *Making Markets*, April, 1927.

The New Style Factory

A few years ago extreme schools of European art set themselves to plan an imaginary factory of a new age, but the result was merely fantastic. Today, America, as part of the search for efficiency, has evolved a new period in the design of factories. It has created this not with strokes of a pen but with steel and concrete. The industrial plant that has beauty is more than its own reward. Those who have studied the question declare that the workman's surroundings show in his work.

The city factory is on its way to take rank beside the skyscraper as a symbol of the achievement of America's constructive genius, touching on one side the problem of the worker and on the other the planning of our cities for beauty. No harm comes from a factory looking like a factory, but the crime is committed when it looks like something else.

The orderly factory already has the first element of apparent usage. The second element is the systematic flow of products. The third element is the modern view that the human machine needs the same attention and care as a mechanical machine.

The city factory does not present the same problem as the industrial plant in the country. Those with the advantages of a rural background furnish striking examples of the new type. Originally factory buildings were laid out by factory men, and the architectural critic condemned them with the saying "it looks like a factory." But today the architect can cite the factory he has built with as much pride as the country house. The National Lamp Works of the General Electric Co. is an example of an industrial plant laid out in a park. The plant has 19 buildings and occupies 90 acres overlooking Lake Erie. Another rural plant, that of Doubleday, Page & Co., at Garden City, L. I., is surrounded by extensive gardens. There is always a waiting list for jobs at this plant. The serious architect today will find the factory problem as interesting as that of the church or courthouse. The factory building presents architectural possibilities that are inviting and stimulating.—Michael Dillon, *Industrial Digest*, February, 1927.

Diamond Dies for Drawing Wire

Hard materials of every description have been tried for the use of dies for drawing fine wires, but such drawing is now done almost exclusively through diamond dies. Lately, dies made of a ferro-tungsten alloy have been adopted for the hot drawing of refractory and hard metals, but the use of such dies is limited to that field.

The average size of stones for fine holes is from ¼ to ½ carat, but for larger wires diamonds up to 4 carats are used. The narrowest point of the

hole is the "size" of the die, and it is kept within 0.0001 in. limit of the specified size. The wear of the die depends upon the hardness of the wire and the number of feet of wire drawn through it. The drawing speed does not influence the wear.

The drilling of a diamond die takes several days' time, and sometimes weeks. The drilling is an abrasive operation, and the needle is operated at the highest speed which it is mechanically possible to obtain. Special drilling machines are used for the purpose. A diamond die is mounted by molding a copper sleeve around it, or by filling in with a brass or silver solder.—Rudolf Wildermann, *Wire and Wire Products*, April, 1927.

Five Companies Tell How They Keep Their Plants Clean

Rather detailed information concerning the methods used by five representative automobile companies for keeping their plants clean, with a minimum of indirect expense, has been obtained. The proportionate number of men employed in cleaning work varies from 1-37 to 1-89 in the cases investigated. When the quantity of waste material is large, mechanical handling equipment for its disposal has been used with a resultant saving in labor cost. Regular clean-up campaigns and bulletins have been used with success. Some sort of incentive wage system for the men employed in cleaning can be instituted with as satisfactory results as in other kinds of work.

In the Paige-Detroit plant 13 men and a foreman clean the machine shop, motor assembly department, and chassis assembly department, while the remaining departments do their own cleaning.

Chrysler applies the group bonus plan that is employed for all its workers. In the Dodge plant the men cleaning floors are paid an hourly rate plus a bonus based on previous performance. For window cleaners a piece rate is employed. Nash uses day and piece rates, Paige uses day rates, while another large producer uses day rates principally, but also a task basis.

In the Nash foundry electrically charged belt conveyors are used to sort out iron and steel bits from the core and molding sand. In the forge, belt conveyors are used to carry out scrap trimmings. In the Paige plant metal chips, turnings, and borings are accumulated in trunnion barrels which are removed after working hours. Dodge employs chip crushers, sheet steel balers, and briquetting machines, all provided with the necessary conveyor equipment, and a vacuum cleaning system in the office. Another company has a tunnel through the center of the shop which is connected with the various departments by conveyors.

All floors seem to be cleaned at least once daily while windows are washed, depending upon their location, from once a month to once a year. Painting is done systematically both for lighting and for identification of dangerous objects or objects for special uses.—K. W. Stillman, *Automotive Industries*, March 19, 1927.

Electric Arc Welding in Maintenance Work

The use of electric arc welding has grown rapidly in maintenance work because in many cases it has enabled production delays and repair costs to be greatly minimized. One important advantage of arc welding is that it permits the repair of heavy gray-iron castings without the necessity of dismantling or preheating. A long time is required to repair heavy shear frames, for example, and if they have to be taken outside the plant and preheated, a considerable delay is experienced. Large plants, in which heavy production schedules are maintained, will find that arc-welding equipment is an investment that may be considered in the same class as insurance. In the case of a plant using special machinery, failure by breakage or through wear, causes serious delays. Such parts take a long time to obtain.

The saving in time made by the use of electric welding in the operation of railroads and steamships is widely known. Practically every shop of the important railroads of the country is equipped with arc welding apparatus. Broken locomotive frames and leaking boilers are repaired in a remarkably short time. It has been stated that nearly 50 per cent more locomotives would be required on the railroads of this country if it were not for the speed with which repairs can be made with arc welding.—Robert E. Kinkead, *Industrial Engineer*, March, 1927.

Annealing Methods

Light and irregular shaped castings that are likely to be distorted when red hot by the weight of the settling contents of the annealing box should be carefully packed. When care is taken to see that each piece makes contact at as many bearing points as possible, little difficulty will be encountered from warpage. This settling is often accomplished by vibrating the container or annealing box. The vibrations are produced by mechanical means in the case of malleable casting that are subjected to long periods of heat-treatment, and the same methods should prove effective in the case of parts packed in annealing boxes.—James McIntosh, *Machinery*, March, 1927.

Merits of Air-Cooled or Water-Cooled Aviation Engines

The U. S. Navy has both air- and water-cooled engines in planes of various types and can compare some of their advantages and disadvantages, as well as the good and bad points of different engines of the same type. A test showed the air-cooled engined plane exactly equal to the water-cooled engined plane in horizontal speed with the water-cooled engine turning 300 r.p.m. faster. The air-cooled job gains its top speed more quickly both in horizontal flights and in power dives. In dead stick dives the water-cooled, being heavier, gains more rapidly. The air-cooled fighter will outclimb and outmaneuver the water-cooled planes, meaning that it handles easier, responds to controls faster, due both to lighter weight and better balance, giving it the advantage in close fighting.

Air-cooled engines of the radial type do not, however, give as clear a vision ahead as the water-cooled engine which is serious in combat machines and may necessitate a periscope gun sight. The absence of the radiator is on the other hand a great advantage. As one pilot says, "Get rid of the profane plumbing and all your troubles are over."—By Lt. Comdr. F. W. Wead, *Aviation*, March 21, 1927.

Measuring Maintenance Efficiency by Unit Costs

Every business should have some means of measuring the service rendered by the individuals who turn out the work. The kind of work, of course, varies with the character of the business, but in these days, in order to be successful in business, a measure of the service rendered by the respective employees is essential. It is a basis on which the output is determined. Comparative unit costs measure not only the quantity but also the cost of like work performed by individuals, or groups of individuals. The first analysis of these costs compares the cost of the work under the jurisdiction of each division engineer, and as he in turn holds the district engineers responsible in their respective districts, the costs are subdivided to compare the work under the jurisdiction of each district engineer. Since the district engineers in turn hold the superintendents responsible for the work in their respective sections, the costs are further sub-divided to show the comparative costs of the work under the jurisdiction of each superintendent. Finally, as the superintendents hold the foremen or caretakers in charge of the sub-sections responsible, it is necessary to sub-divide further the costs, so that a comparison can be made of the costs of the work under the jurisdiction of each foreman.

These costs will bring about a spirit of competition and friendly rivalry that immediately results in raising the standard of the morale of the organization, as well as in increasing production at a decreased cost. It makes each foreman or caretaker a more important factor in the organization than he formerly was, and schools him in business. It teaches him economics as it makes him appreciate the value of a dollar as applied to his work. The result of such a system invariably has been that it has made the men more appreciative of the importance of their jobs. It gives them an added interest and sets them thinking in a bigger way about the problems involved. In the first place, the spirit of competition gets into their blood and if they are any good at all, for the sake of this alone, they will be jealous of the quality of their work.

Another plan to stimulate the spirit of friendly rivalry among the maintenance employees is the practice of having the maintenance men inspect each other's work, at least once a year, and determine among themselves who is doing the best work.—By W. H. Connell, *Engineering News-Record*, March 24, 1927.

American Machinist

Editors: KENNETH H. CONDIT AND FRED H. COLVIN

Established 1877

How Interchangeability Affects Repairs

COMMERCIAL interchangeability in manufacture is affecting the maintenance of machinery of various kinds. In automobiles, for example, service stations are now very frequently places where new parts are substituted for those worn in service, rather than for repairs as we formerly knew them. It is not uncommon in some localities to replace even cylinder blocks rather than to have them reground.

For this reason we do not find the machine equipment in many service stations that we might expect. The mechanics adjust carburetors, spark advance, steering connections, etc., and occasionally weld a broken part that cannot be readily obtained. But repairs for the most part consist in replacing pins and bushings, rather than doing any of the machine work that formerly made up the work of the garage or service station. This was particularly noticeable in a recent visit to Cuba, where practically no machine work was done in the largest service station on the island.

There are numerous small, one-man shops where, as with us, the ideas of overhead are either very vague or forgotten altogether. These shops do what tinkering is done on automobiles, such as rejuvenating cars that belong in the factory cupola. The main equipment of the service station is a goodly supply of parts, both standard and oversize, rather than of machines for making new, or fitting old, units.

The Geneva Economic Conference

NOW that the World War is practically a decade behind us the United States and the countries of Europe can turn their attention to the economic problems of the present and the future, to the end that wise policies may be formulated. The forthcoming economic conference to be held at Geneva should mean much to the American business man. It is the first conference of an economic nature to be held since the war and the delegates have been chosen from among the most distinguished men of the various countries. The delegates are not confined to any particular economic group and are therefore free from the bias that would be unavoidable if they were all bankers, or all agriculturists.

European industry is getting back on its feet and looking longingly at the United States as a rich market for its products. The foreign markets of American merchants are also certain to be attacked more intensively by European competitors. In view of this situation it is vitally necessary for American business men to know how their competitors stand economically. Are they in a position to extend longer credits to foreign buyers? Do they believe in quoting lower prices to foreign customers than to the domestic trade? Are they equipped to render adequate service abroad? To what extent can they form combinations and cartels? Will their governments assist actively in the formation of such organizations? Do they have statistics and trade information that Americans do not have?

The conference will afford an opportunity to get a broad picture of world economic conditions. Specifically, such subjects of discussion as industrial management, standardization, technical and industrial research, technical education and the recruitment of technical staffs will appeal particularly to readers of the "American Machinist." Consequently, the publishers have decided to send a vice-president of the company to observe the doings of the conference and report them for the benefit of the readers of all McGraw-Hill papers. His interpretations of the conference activities will be valuable aids to American business men who are seeking light on the problems to be discussed.

Chuck Standards Suggested

MILLING machine spindle standardization has attracted widespread attention. It has done much to raise anew the flagging hopes of many who had become discouraged as to securing any sort of standardization.

Among those who have taken courage is an advocate of standard face plate recesses for lathe chucks, who calls our attention to the desirability of having uniform sizes for this much used attachment. Whether this be necessary from the standpoint of interchanging chucks and face plates or not, there seems to be no logical reason why there should be a variety of flange diameters. Manufacturing considerations alone make standardization desirable and it should not be difficult for chuck makers to get together and select sizes that would simplify their own production problems and at the same time satisfy the requirements of lathe builders and users.

Drill chuck arbor holes might also be standardized at the same time to the advantage of all concerned. Both subjects can be taken up without difficulty and it would hardly seem as though standardization committees would be necessary in these cases.

Shop Equipment News

Gallmeyer & Livingston No. 5 Universal Cutter and Tool Grinder

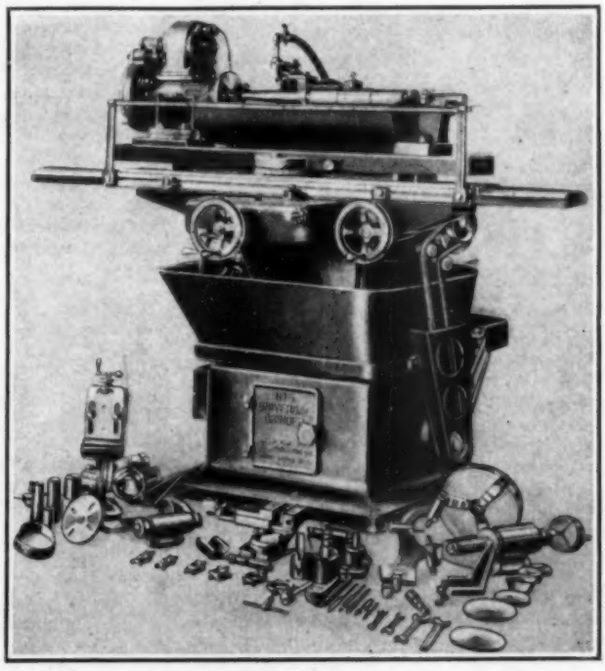
THE No. 5 universal cutter and tool grinder shown in the accompanying illustration was recently placed on the market by the Gallmeyer & Livingston Co., Grand Rapids, Mich. The machine can be arranged for either wet or dry grinding, and it is furnished either belt driven or with a self-contained motor drive as shown. The motor-driven machine is a self-contained unit with a 1½-hp. motor mounted in the base and belted to the grinding wheel spindle over two sets of ball-bearing idler pulleys. Two spindle speeds are available. A ¼-hp. motor built into the headstock revolves the work.

The machine can be furnished either with hand feed or with power longitudinal movement of the table. When power feed is furnished, four speeds are available of approximately 8, 14, 25 and 44 in. per min. By means of trip-dogs capable of being set to close limits, automatic positive reverse is available so that shoulder work can be ground conveniently. The gear box is mounted rigidly on the saddle, and the gearing and reverse clutches run in a bath of oil, housed tightly to exclude all dirt. This heavy-duty tool grinder is rigidly contructed throughout. The knee is a true box-section and is completely inclosed when mounted in place against the flat elevating surface of the outer sleeve. The knee ways are ample in dimensions and the bearings for carrying the saddle are spaced 13 in. apart to give a rigid support. The casting carrying the grinding spindle swivels to 90 deg. in either direction with graduations to indicate the setting. It is locked to the inner column, but is so fastened that it does not pinch the outer sleeve.

The machine can be adjusted in either of two ways: by locking the spindle head in position on the central column and swiveling the sleeve and knee around it, or by leaving the sleeve locked in a fixed position and swiveling the head to the desired position. In some instances the difference in direction of artificial and natural light make it desirable to take advantage of being able to adjust either or both parts of the machine. One setting can be used for daylight and another for artificial illumination for maximum convenience.

The spindle itself is made of high-grade hammered steel and is accurately ground. Either ball bearings or bronze sleeve bearings can be supplied.

The machine can be operated either from the front or the rear, and transverse, vertical and longitudinal movements are available in either position. From the front position both a rapid-action lever handle is available for longitudinal movement, as well as a slower handwheel movement. For both vertical and cross feed movement the handwheels are graduated in thousandths, which may be split as the graduations are fairly coarse. The pointers have movable set collars to make reading easy.



Gallmeyer & Livingston No. 5 Universal Cutter and Tool Grinder

SPECIFICATIONS

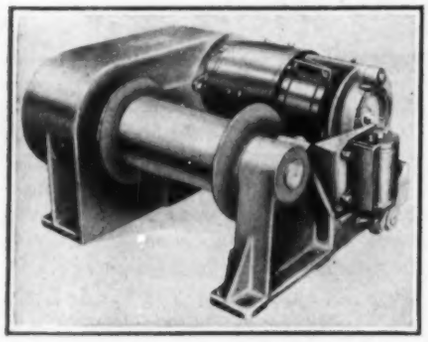
Maximum swing between centers (reamer grinding), in.	10½x42
Maximum swing between centers (cylindrical grinding), in.	10½x38
Longitudinal travel, in.	32
Transverse movement, in.	10
Vertical movement, in.	10¾
Size of table, in.	6x50
Length of saddle ways for longitudinal movement, in.	43
Center line of spindle to table, in.	10¼
Capacity for face milling cutters on periphery, in.	24
Capacity for face milling cutters on face, in.	30
Headstock spindle hole taper	No. 14 B. & S.
Net weight with standard motor drive, lb.	2,000
Crated weight, lb	2,150

Stationary "Lo-Hed" Hoist

The stationary "Lo-Hed" hoist shown in the accompanying illustration was developed by the American Engineering Co., Philadelphia, Pa., for use either overhead or on the ground, but in either case it is to be mounted in a fixed position.

The standard machine consists of a smooth drum, driven by a motor through a train of spur gears, all mounted on a common bedplate. Both the motor and gears are completely inclosed. The gears are made of drop-forged steel, heat-treated, and run in a bath of oil. All gear shafts are mounted on Hyatt "high-duty" roller bearings. The cover of the gear case is easily removable for inspection purposes. The drum has large flanges which prevent the rope jumping the end and give a maximum stowage capacity.

Shop Equipment News



Stationary "Lo-Hed" Hoist

A fully-inclosed ball-bearing motor is used, especially designed for hoist service. Either a.c. or d.c. motors can be supplied. The controller is of the single-speed, reversing drum type.

When desired, various modifications in the hoist can be supplied, such as grooved drums, air or steam motors, push-button and remote control, holding and lowering brakes, and extension shafts with additional heads, etc. The unit is furnished in sizes for handling loads from 500 to 4,500 pounds.

Pollard "Tool Tender"

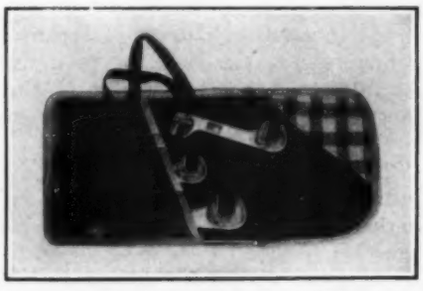
The stand shown in the illustration, termed a "Tool Tender," was recently added to the line of factory equipment made by the Pollard Bros. Manufacturing Co., 4035 N. Tripp Ave., Chicago, Illinois.

This device is similar to the tool stand that this company has been making for several years except that the pan is deeper and a cover has been provided. This cover is made of heavy sheet steel and is flanged on all sides to add to its strength and rigidity so that it will carry a heavy load without bending. It is fastened to the pan by means of strap hinges and has a strong hasp in addition so that tools or parts can be safely locked in the cabinet.

Pollard "Tool Tender"

Bonney No. 4 Wrench Kit

The Bonney Forge & Tool Works, Allentown, Pa., has introduced the No. 4 wrench kit illustrated, consisting of three popular-size right angle wrenches. These wrenches are made of chrome-vanadium steel and are of the double-end type, but vary from the conventional, open-end wrench in that the jaws are at right angles to the handle.



Bonney No. 4 Wrench Kit

These wrenches are guaranteed to be stronger that the bolt or nut that they fit and will strip the thread or break the bolt without damage to the wrench.

Trade Catalogs

Pipe Tools. The Armstrong Bros. Tool Co., 317 N. Francisco Ave., Chicago, Ill., has recently issued its Pipe Tool Catalog No. P-10. In it is described and illustrated this company's complete line of stocks and dies, pipe cutters, pipe vises, chain pipe tongs and pipe wrenches. It is well illustrated throughout and contains twenty-four 5x7½-in. pages. The publication is indexed.

Speed Reducers. The D. O. James Manufacturing Co., 1114 West Monroe St., Chicago, Ill., has just released an advance supplement of its catalog No. 133 on its continuous-herringbone gears and speed reducers. The various advantages of this type of gear are pointed out, and numerous examples of various units constructed are illustrated.

Steel, Electric. The Latrobe Electric Steel Co., Latrobe, Pa., has published its general catalog E. This publication contains 204 pages, 4¾x6¾ in., well illustrated throughout. It is completely indexed. The properties of each particular class of steel are pointed out and instructions are given for forging, annealing, hardening and tempering of each class of material. A number of useful tables and some general information is appended.

Pamphlets Received

Engineering Foundation Report for the year ended February 17, 1927, is now available and may be obtained from the Foundation at 29 West 39th St., New York, N. Y. The report contains thirty-two 7x10-in. pages and is illustrated with photographs of the Stevenson Creek Experimental Arch Dam, tests of which the Foundation is sponsoring. A brief summation of the work done in the past year is given, as well as a financial statement and organization details. A list of available publications is also presented.

Hardness Numbers. The Department of Commerce, Bureau of Standards, Washington, D. C., has recently published Technologic Paper No. 334, entitled "Relationship Between the Rockwell and Brinell Numbers," by S. N. Petrenko. The publication can be obtained from the Government Printing Office, Washington, for 15 cents. It is part of Vol. 21 and contains pages 195 to 222 inclusive. The theoretical relationship between these two hardness numbers is first explained in considerable mathematical detail, followed by a summary of the experimental relationships. Conversion tables are then presented and their accuracy is discussed. Other investigations along this line are described. Investigation on the relationship between the tensile strength and Rockwell number is also included.

Contract Terms, Warehouse. The Department of Commerce, Bureau of Foreign and Domestic Commerce, Washington, D. C., has published domestic commerce series No. 18, entitled "Warehouse Contract Terms." It contains standard contract terms and conditions for general merchandise and cold storage warehouses. These standardized contract terms are the result of co-operative work of the Bureau with warehousemen and other interested groups. A list of acceptors is included. It contains names of warehouse companies, banking interests, shippers and receivers of freight and railway organizations. The pamphlet may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., for 5 cents.

NEWS OF THE WEEK

Engineers at Kansas City Meeting Study Education and Management

Student branches join in three-day technical program

EDUCATION, training and management for industry occupied the attention of a three-day regional meeting of the American Society of Mechanical Engineers, held at the Baltimore Hotel, Kansas City, Mo., starting April 4. The combined meeting, which was subdivided into several sessions, drew an attendance of 325 members and guests, including students of the engineering schools of the Universities of Missouri, Kansas and Nebraska, who are affiliated with the society through its student branch.

The first day was devoted to an educational session in which three papers were presented, "Railway Apprenticeship in a National Institution," by F. W. Thomas, supervisor of apprentices, A. T. & S. Fe Railway; "Industrial Problems or Difficulties," by L. A. Hartley, director of education, National Founders' Association; and "Education for Industries," by P. F. Walker, dean of the school of engineering, University of Kansas. William T. Magruder, vice-president of the society, presided.

In outlining the Santa Fe's apprentice system, Mr. Thomas said: "Just as there are no two human beings alike, so are there no two managers who manage alike. There would be but little difficulty in promulgating a scheme for training apprentices on all railroads if this condition were true. The rub comes when an attempt to apply the scheme that each manager deems the better. If we are to have an apprentice scheme fitted to our needs, it must be fitted to the times and to the boy of the day.

Executive Material

"While our chief aim is to provide first-class skilled mechanics to man our shops, we enjoy other blessings from our apprenticeship system. It furnishes ample material for all our shop foremen, draftsmen for our designing and drawing rooms, assistants for the test departments, staff officers and inspectors." An outline of the methods used in selecting and training the boys was given.

Mr. Hartley, in his paper, pointed out management's part in the development of foremen. He mentioned several systematic procedures to follow in this work, which included the following:

"Representatives of management in every major department, or, in the case of a comparatively small plant, the general superintendent, should meet with the engineer in charge of the program of contemplated development and prepare a comprehensive statement of organization difficulties.

"The engineer in charge of the program should next prepare for his own use a series of notes on general topics covering the principles involved in the solution of each recorded difficulty.

"Daily difficulties should be recorded by foremen and should be made a part of his routine, exactly as is the recording of orders for material. These difficulties then should be studied by managerial representatives directly interested in their solution.

Committee Meetings

"The next step is to assemble foremen for the discussion of general principles underlying these problems. Then, committees should be assembled according to the exact distribution of interest in the solution of the problem. When sufficient improvement has resulted to justify, plant assemblies of foremen and executives should be held to recognize the contributions of committees. Certain leading workers who may be in line for promotion should be invited to these meetings as a mark of esteem."

In his paper, Dean Walker asserted that the economic situation has changed to the extent that one of our great problems is that of leadership—the directive force that must guide the mass in its work. In part the paper read:

"The direct issue confronting us in this developing phase of commercial activity is competition in the world market. To produce at low cost with a high wage scale is an achievement of no small magnitude. To accomplish the necessary result of low production cost will require all of the ingenuity and energy of which our industrial administrators are capable. The waste of time and effort represented by friction, unrest, rapid labor turnover, and misfits in the industrial machine must be reduced.

"There are several distinct types of educational training required in fulfilment of economic demands. First, there is a need for general education among the masses. This refers to the general public as well as to people actually engaged in industrial pursuits. Secondly, there is need for more complete and thorough job training. This includes the general problem of apprentice instruction, a phase of our industrial life which is undergoing change at the present time.

"The third vital need is for foreman training. Needless to say, it touches the vital spot in our industrial system, namely, the problem of leadership. There is no more vital principle in the whole scheme of industrial training. The effectiveness of the shop-committee system, and the means for carrying to the mass of workers correct information respecting the progress of the business and the aims and policies of the higher administration, depend on the type and efficiency of these foremen. In a very real way foreman training is essential to the future development of industrial enterprise in this country. Finally, the need of industry for men of definite qualifications carries us into the field of formal education."

Dean Walker acted as chairman for the management session held on the second day. The three papers presented were: "Industrial Management," by James McQueeney, of the Loose-Wiles Biscuit Co.; "The Management of Railway Shops and Terminals," by William R. Harrison, master mechanic of the Santa Fe shops at Argentine, Kansas; and "Personnel Administration in the Steel Industry," by F. V. Larkin, director of mechanical engineering, Lehigh University.

In discussing industrial management, Mr. McQueeney outlined the methods employed in his plant relative to operation and production control. The papers by Messrs. Harrison and Larkin were very interesting.

Inspection Tours

All business for the second day of the meeting was concluded at noon so that inspection trips to industrial plants could be made. These tours, arranged by F. S. Dewey, chairman of the Kansas City Section of the society, permitted a visit to either of five plants, namely, the Northeast station of the Kansas City Light & Power Co., the North Kansas City Waterworks plant, the Sheffield Steel Corporation, the American Radiator Co., and the Standard Oil Co.'s Sugar Creek refinery. An optional trip to the University of Kansas at Lawrence also was arranged.

The morning session included discussions on petroleum, power and fuel, and a joint session of the management and power divisions to discuss problems characteristic of Kansas City. The papers read at these sessions were:

"Drilling and Pumping-Rig Equipment," by Glenver McConnell, mechanical engineer of the Roxana Petroleum Corporation.

"Electrical Applications in the Oil Fields," by D. M. McCarger, engineer of the oil field division of the Wagner Electric Corporation.

"Lubrication of Diesel Engines, Correct and Incorrect," by W. O. Northcutt, of the Sinclair Pipeline Co.

"Treatment of Feedivater for Industrial and Power-Plant Boilers," by S. T. Powell, of the Chemical Engineering Co.

"Present Tendencies of Steam-Station Design," by V. E. Alden.

"Low Temperature Distillation," by Walter Runge, of the International Combustion Engineering Corporation.

"Burning of Mid-Western Fuels," by E. L. McDonald, efficiency engineer of the Kansas City Power and Light Co.

"Industrial Furnace Fundamentals," by Victor J. Azbe, consulting engineer.

"Production and Distillation of Fuels," by C. M. Young, professor of mining engineering, University of Kansas.

"Protection of Flour Mills and Grain Elevators Against Fire and Explosion," by F. D. Hoxie, engineer of the inspection department of the Associated Factory Mutual Fire Insurance Co.

"Mechanical Engineering in the Flour-Milling Industry," by M. D. Bell, assistant general superintendent of the Washburn-Crosby Co.

"Some Applications of Machinery as Applied to Agriculture," by O. B. Zimmerman, of the International Harvester Co.

A dinner dance was held on the first day and a banquet on the second day. The afternoon of the third day was devoted to a tour of the city under the auspices of the Chamber of Commerce.

E. J. Mehren Will Report Geneva Conference

In order to give American industrialists and engineers first-hand information on the deliberations and conclusions of the international Economic Conference at Geneva, the McGraw-Hill Publishing Co. is sending Edward J. Mehren, one of its vice-presidents, to the meeting. He will sail on the same ship with the American delegates and experts on April 20. Mr. Mehren will report his observations in *American Machinist*. He will also cover in articles in this paper summaries of the reviews, made at the conference, of the economic positions of the principal countries of the world.

In his editorial travels, Mr. Mehren has covered engineering and industrial developments in every part of the United States, in eastern Canada and in the leading countries of western Europe. His general connection with the McGraw-Hill papers and contact with the fields they represent have given him a broad knowledge of American industrial and engineering problems and methods. This will be the background he takes to Geneva.

In addition to his experience gained through his editorial and publishing work, Mr. Mehren was at one time manager of the Emerson Co., and was associated with Harrington Emerson in the height of the "efficiency" movement, thus securing an intimate insight into management technique. He was one of the organizers of the National Association of Corporation Schools and of the war-time Highway Industries Association. He has been a director of the New York Building Congress, and is director of the American Arbitration Association, and chairman of the arbitration committee of the American Society of Civil Engineers.

The conference, sponsored by the League of Nations, will attempt to determine the economic difficulties which prevent the revival of general prosperity, principally in Europe, and to ascertain the best methods of overcoming these difficulties. Five delegates have been appointed by President Coolidge, and will be accompanied by experts selected from government departments. Non-member nations as well as member nations have been asked by the league to send delegates. The acts of the delegates are not binding on their respective governments.

For more than a year, a committee of 35 persons, drawn from 21 countries, has been working on the agenda and upon the data to be laid before the delegates. The topics fall under four heads—economic causes and tendencies, commerce, industry and agriculture.

Documents have been prepared, under the industrial classification, on coal, iron and steel, shipbuilding, the

Edward J. Mehren

chemical industry, the electrical industry, legislation on cartels and combines, industrial management and standardization, technical and scientific progress and research.

In the preparation of the data for the delegates, the preparatory committee was assisted by the International Labor Office, the International Institute of Agriculture, and the International Chamber of Commerce.

It is expected that topics that cannot be adequately traversed during the conference sessions will be referred to subcommittees for further research.

Welding Society Meeting

The program for the eighth annual meeting of the American Welding Society includes a symposium of research activities in the welding field during the past three years. This session will be held on the morning of the second day of the three-day meeting, to be held in the Engineering Societies Bldg., New York, April 27, 28 and 29. Committees that have been studying gas welding, arc welding and production welding will make their reports at the meeting. Regular meetings of the board of directors, election of new officers and a program of entertainment take up the balance of the time.

President Heads Speakers at Chamber Meeting

A distinguished list of speakers, including President Coolidge and Secretary of Commerce Hoover, will address the fifteenth annual meeting of the Chamber of Commerce of the United States, which will be held in Washington, May 2 to 5. This national gathering of business leaders from all parts of the United States has been called for the purpose of discussing the important economic changes that have taken place in the business life of the nation during the past few years. The discussions will center around the major topic, "The New Business Era."

President Coolidge's talk will be delivered before a joint meeting of the National Chamber and the Pan-American Commercial Conference. The latter conference will be attended by representatives from the Latin-American countries and will be held in Washington during the week of the meeting.

Other Prominent Speakers

The list of speakers includes the names of business men prominent in practically all lines of industry, finance and commerce. Among the speakers will be: John W. O'Leary, president of the National Chamber; Silas H. Strawn, Chicago; John Lawrence, Lawrence & Co.; Victor Cutler, president, United Fruit Co.; Walter Parker, New Orleans; R. E. M. Cowie, president, American Railway Express Co.; Paul T. Cherington, manager research department, J. Walter Thompson Co.; L. D. H. Weld, H. K. McCann Co.; Hugh R. Pomeroy, secretary, Regional Planning Commission; Harvey W. Corbett, New York; Major Henry W. Curran, New York City; H. A. Smith, president, National Fire Insurance Co.; Doctor S. S. Huebner, professor of insurance, University of Pennsylvania; C. A. Ludlum, vice-president, Home Insurance Co.; James S. Kemper, president, National Retailer's Mutual Insurance Co.; F. Highland Burns, president, Maryland Casualty Co.; Leroy A. Lincoln, general counsel, Metropolitan Life Insurance Co.; Dwight B. Heard, president, Dwight B. Heard Investment Co.; Charles W. Lonsdale, president, Simonds-Shields-Lonsdale Grain Co.; Theodore F. Whitmarsh, president, Francis H. Leggett & Co.; Fred I. Kent, vice-president, Bankers Trust Co.; Henry D. Sharpe, president, Brown & Sharpe Manufacturing Co.

A statement issued by the chamber states that the meeting will be one of the most important held by the chamber. American business sweeping forward under the play of new economic forces, finds it more necessary than ever to look into the future. The new business era demands the careful weighing of many problems. It calls for study of complicated relationships. Trades and industries are entering new fields. Business units and conditions are changing. New points of contact with government and within commerce and industry are being developed. The meeting will survey economic trends with the purpose of determining their meaning, with the hope of throwing light into the future.

Germany Shows Moderate Improvement in Machinery Imports and Exports

Comparisons with pre-war figures

By Our Berlin Correspondent

THE returns of Germany's machinery trade in the past year were quite satisfactory, showing a reduction of import and an improvement in the export business. Considering the care and attention the export business is receiving from manufacturers, the results are somewhat disappointing.

When the machinery import rose rather suddenly from 13,300 tons in 1924, to 38,000 tons in 1925, it was hoped that this swelling of the import figure was of a temporary nature only. The drop of 4,000 tons from 1925 to 1926 is doubtless due solely to last year's business depression.

There were strong ups and downs in the German machinery import during post-war years, but the general tendency is unmistakably an ascending one, as can be seen from the following figures:

GERMAN MACHINERY IMPORT

	Tonnage	Value (Million M.)
1913	82,015	....
1920	Practically nil	....
1922	10,731	(Not ascertained during inflation times)
1923	5,491	11.3
1924	13,282	26.7
1925	38,425	76.6
1926	34,391	67.3

It would seem most natural that the pre-war ratio between export and import, which in 1913 was 1:0.17, and in 1926 was 1:0.08, was slowly asserting itself. The German machine building is now far less progressive than it used to be, which is not surprising, and there is no reason why it should be able to guard its domestic market against invasion better than in pre-war times. The German import problem of machinery, and of finished products in general, is not so much one of demand as it is one of the German purchasing power. The demand is doubtless stronger than in pre-war times, although it has to remain partly latent, because the constantly growing interchange of improvements automatically tends to a corresponding interchange of products. There is another reason, which is not generally recognized, but which is becoming more and more apparent. The German manufacturers have abandoned the old-time "general provider" idea and with rapidly progressing specialization some vacancies have developed, which very often no one cares to fill, leaving it to import to take care of the demand. Broadly speaking that type of German manufacturer, eager to take up building any new machine that showed itself in foreign markets, has disappeared. The manufacturer of today, who carefully weighs marketing conditions, questions whether it would pay before taking the risk. This change is quite a salient feature of present day developments. It can, of course, be easily traced to the growing understanding of what specialization really means.

Scrutinizing the different classes of machinery imports, it appears that the returns vary greatly in post-war years, and from those of 1913. It is obvious that the process of readjustment is far from completed.

In the group of traction machinery, including railroad locomotives and tenders, the import has risen from 439 tons in 1925, to 1,874 tons in 1926, of which 343 tons were returns. Of the 1,441 tons remaining, 1,361 tons fall to the share of tractors for agricultural purposes, costing 3,083,000 M., as against 1,096 tons in 1913, costing 1,000,000 M. About 90 per cent came from the United States.

The import of power generating machinery of all classes, except electric generators, shows a slight drop from 2,033 tons in 1925, to 1,987 tons in 1926. The stated value remained practically the same. In 1913 some 2,918 tons of such machinery were imported. The dominant change in this field is the almost complete disappearance of the steam turbine import, which in 1913 amounted to 742 tons, chiefly of Swiss origin; and in growth of the import of gasoline motors for motor cars and other vehicles of which 336 tons were imported in 1913, as against 1,356 tons in 1925, and 2,101 tons in 1926. In 1925 these were supplied chiefly by Switzerland, but the United States took in 1926 a large share, about 30 per cent, of the import.

Germany continues a good market for British textile machinery. In 1925 this import reached almost that of 1913. In 1926 it dropped by over 3,000 tons to 14,995 tons. More than half of this machinery came from Great Britain; the rest is divided between Switzerland, France, America, and Czechoslovakia. The American import in this field made considerable progress last year and captured part of the British and French import. That from Switzerland held its own. The chief components of this class of import are cotton dressing and spinning machines and weaving looms.

The import of metal working machine tools in 1926 amounted to 2,683 tons, as against 4,508 tons in 1925, and 6,427 tons in 1913. About 60 per cent of the total came from the United States, and 8 per cent from Switzerland; the rest from Austria, Great Britain and a number of other countries. The import comprised 6,187 units, compared with 5,211 in 1925. The number of tools imported was greater in spite of the drop of the tonnage. The value totaled 6,343,000 M., compared with 11,393,000 M. in 1925. The most remarkable change has taken place in the case of agricultural machinery. In 1913 almost 39,000 tons of such machinery were imported into Germany. This import has diminished to 3,944 tons in 1926, and 3,302 tons in 1925. This fact is largely responsible for the large difference between the machinery import of 1913 and of 1926. Nearly 75 per cent of this difference is due to the decreased import of agricultural machinery. Practically only one item of the latter is concerned—harvesters, of which 32,000 tons were imported in 1913, 5,541 tons from Great Britain, and 25,500 tons from the United States. In 1926 the import of this class of machinery was only 1,814 tons, 668 tons of which came from Canada, and 880 tons from the United States. America has lost a large market, which is doubtless due to the fact that the large American manufacturers of agricultural machinery, which prior to the war had a strong foothold in Germany, failed to re-establish their selling organization after the war.

In the tabulation are given the import figures of 1926 for the chief classes or groups of machinery, in comparison with 1925 and 1913.

Comparing the returns of 1926 with those of the previous year, it is seen that the import had a general downgrade tendency. Only in a few instances has a rise taken place. They remained far below those of 1913 with a few exceptions only. The difference between 1913 and 1926 is still stronger than it appears on paper, taking into account the import from former German territory.

IMPORTS

	Tonnage 1,000 Metric Tons			—Value 1,000 Gold M.—		
	1926	1925	1913	1926	1925	1913
Traction machinery, railroad engines, tenders, etc.	1,874	439	1,634	3,649	589	160
Power generating machinery, except electric generators	1,987	2,033	2,918	6,765	6,762	110
Textile machinery	14,995	18,644	16,121	22,018	30,133	12,200
Pumps and fire extinguishing machinery	428	389	745	1,041	737	800
Metal working machine tools	2,683	4,508	6,427	6,343	13,901	8,900
Wood-working machinery	281	539	771	548	1,142	700
Agricultural machinery	3,944	3,302	38,535	6,371	4,801	29,300
Hoisting machinery	1,014	764	1,736	966	999	1,500
Machinery for the ceramic industry	939	1,275	462	1,050	1,578	300
Printing presses	811	1,240	1,285	2,693	2,760	1,900

Cleveland Metal Trades Elect Officers

W. D. Hammerstadt was re-elected president of the Indianapolis branch of the National Metal Trades Association at the twenty-first annual meeting of the branch. Fred Hoke was elected vice-president; L. M. Wainwright, treasurer; and L. C. Breunig, W. K. Swigert, P. F. Wright and George P. Torrence, directors. The following district committee members of the national association also were elected: John T. Wilkin, of Connersville; D. O. Thomas, of Muncie; Eugene Gruenewald, of Lafayette; R. P. Johnson, of Muncie; and Henry Langsenkamp, of Indianapolis.

Paul T. Norton, of Columbus, president of the national association, spoke on "Business and Labor Conditions." Other speakers included H. D. Sayre, national commissioner, and Albert Kauffman of Chicago, president of the Link Belt Co.

The Business Barometer

This week's outlook in Commerce, Finance, Agriculture and Industry

By THEODORE H. PRICE
Editor, Commerce and Finance, New York

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THE income tax figures published last week bear eloquent testimony to the country's prosperity. They relate to payments made during 1926 upon incomes received during 1925. They show that in 1925 there were 207 persons who had incomes of $1,000,000 or more, whereas those who had incomes of a million dollars or more numbered only 75 in 1924 and 74 in 1923.

The compari on argues an enormous increase in the spending power and investment capacity of the ultra rich and it partially explains the demand for income-bearing securities that has now persisted for nearly two years and is still growing as the extraordinary record for the first quarter of this year shows. In that time $1,687,000,000 of bonds were publicly offered, compared with $1,241,000.000 in the same period of 1926.

But the figures published also show that there were but 321,146 persons who had incomes of $10,000 or more in 1925, and while this is an increase over previous years, it is still difficult to believe that there are only 321,000 individuals or families in the United States who have as much as $10,000 a year to spend. This is less than one-half of one per cent of our population and as one walks the streets of the larger cities or notices the number of automobiles that can be seen almost everywhere he cannot but feel that there must be many who are living beyond their means.

It is this feeling that makes thoughtful men question the reality of our apparent opulence and wonder how long it will last. That many buyers are anticipating their incomes is evident from the volume of installment sales, and those who call themselves conservatives point out that the orderly distribution of our industrial output might be rudely interrupted by the breakage of a single link in the golden chain of credit.

But the cautionary view is still unpopular in the stock market and most securities are higher although there are some exceptions to the advancing tendency shown.

The railroad stocks in particular have been strong upon the theory that the transportation industry will be favored rather than opposed by legislation in the future and that the Supreme Court will ultimately decide that the valuation of the roads, upon which the law directs their rates shall be based, must be calculated upon the present cost of reproduction rather than upon investment costs or arbitrary appraisement.

In the circumstances argument avails but little, for it is the speculative mood that counts, and until something happens to change it the public will probably continue to buy. But this is not to say that the advance will continue, for it is likely to be checked by any untoward development that is impressive enough to change sentiment.

For a time the embarrassment of a great Japanese merchant firm threatened to be such an event. But the liabilities, estimated at $250,000.000, proved to be so large that they had to be taken care of, and it is now understood that a group of Japanese banks will undertake an orderly liquidation.

The news was nevertheless unsettling and cotton and sugar both gave way temporarily under its impact. But both commodities soon recovered themselves. The tone of the sugar market is improved, and cotton is commencing to be very sensitive to any bullish developments. Exports now exceed 9,000,000 bales, and excessive rains have already made the crop that is not yet planted a late one.

The other commodity markets call for but little comment, although coffee has continued to sag upon the theory that the forthcoming crop is larger than the official estimates indicate.

Car loadings are again in excess of last year, but most of the gain is coal, and the country now seems so well prepared for the coal strike that it will be without effect. After making a new high record in March a very slight falling off in steel manufacturing is now reported; most mills continue at or near capacity but it remains to be seen whether the production has been sold.

Some of the automobile companies made new sales and production records in March and apparently all but two of the leaders find business extremely satisfactory. Those two, however, are such pronounced laggards that the industry is still behind last year. More definite encouragement — though some think it more alarming than encouraging—can be derived from the building figures. Despite the warnings with which the year opened, confirmed by a declining tendency in rents, contracts awarded during March, according to F. W. Dodge Company, were the largest ever recorded in a single month, and contemplated work reported by the same agency is 16 per cent larger than a year ago.

Distributive trade is good, but the demand for cotton goods is not quite so active and the demand for silk and woolen goods is also slackening. The sales of chain stores show such steady increases that they might be considered exempt from the law of reaction unless it is recognized that part of their gain is due to the growing number of their stores, and is at the expense of other methods of distribution. As a generalization it may be said that business is about up to but not in excess of last year.

WHAT'S DOING IN INDUSTRY

APRIL continues to be a month of uncertain trends in the machinery and machine tool market. In many important industrial centers the volume of sales is below earlier estimates for the period, but the need for shop equipment is still urgent in many large plants and only an ultra-conservative policy on the part of executives seems to be holding up orders.

NEW ENGLAND machinery builders are profiting by the establishment of some extensive manufacturing programs in their territory, and sales are increasing moderately. The New York market is irregular. Optimism prevails in Philadelphia, where some railroad and industrial business is in sight.

MILWAUKEE reports a definite improvement all through the metal working industry. A steady volume of small business is encouraging dealers in the Cleveland district. Cincinnati reports a spotty condition and Chicago is quiet, with the lack of volume from railroads a disappointing feature. Prospective expansion of some automobile manufacturers in Detroit promises good business, but the present situation is inactive.

THE INCOME TAX figures published last week bear eloquent testimony of the country's prosperity. As a generalization, it may be said that present business is about up to but not in excess of last year.

The Industrial Review

Weekly progress of the machinery and machine tool business

THE following reports, gathered from the various machinery and machine tool centers of the country, indicate the trend of business in these industries and what may be expected from the future:

CLEVELAND

Little change is to be seen in the machine tool market in the past fortnight. Orders for one and two pieces were the general run of new business closed. Diversified lines were represented in the buying. April needs only to be a fair month to show a gain over March. Many quotations are out, but buyers are slow in closing. Automobiles are holding back, waiting for General Motors and Ford to announce plans for the year.

Better business for April and May is in prospect due to the increased number of new inquiries coming in. Several of these include large lists. Construction of new and extensions to industrial plants show an increase over 1926, according to building permits issued. One leading architect who specializes in industrial designs reports more projects being planned at present than any time in the last five years.

CINCINNATI

Machine tool manufacturers in the Cincinnati district report that in the past week the market has been of an up-and-down nature, with daily fluctuations in sales. A few concerns report a slight gain over the previous week and none report a loss. Selling agents also report a fluctuating market during the week, but state that it is gaining.

Both branches of the trade state that inquiries are coming in freely. All feel that market conditions are getting better and the general expectation is that a gain will be made in the month's sales. Inquiries received were well diversified and well distributed over the country. While they were almost entirely confined to single tools and replacements, a few fair-sized lists were included. The week's sales were largely confined to single tools and replacements. The principal part of the week's buying was done by general machinists and industrial users. Several re-orders were received, these being duplicate purchases of efficiency tools that had been bought for experimental purposes.

A number of railroad lists are still unfilled, and it is thought that purchasing from these is near at hand. A small number of orders came from the automobile field, these being of an emergency nature and confined to single tools.

DETROIT

The condition of the machinery and machine tool market has changed very little in Detroit during the past week. Several of the leading dealers have experienced a marked improvement while a number of others have barely maintained the average of the past few weeks.

It is generally felt, however, that April will be a highly productive month. Prospects for large orders from automobile manufacturers seem to be very good. Oakland, Chrysler and Hudson have done some buying during the past few days but the orders have not been large. With the expectation of a drastic change in the motor of one of the largest manufacturers there has been a decided tightening of interest in all branches of the machinery and machine tool field.

The promise of startling revelations by Durant has caused many rumors, but the fact that no definite plans were announced has caused a diminution of interest.

In general, the business and financial situation in Detroit and the immediate vicinity is unchanged. Conditions are relatively stable and encouraging but a trifle below the average of this month last year.

NEW ENGLAND

New products are providing increased business in the machinery trade in Hartford, the Pratt & Whitney Aircraft Co., increasing its working force as rapidly as shop equipment permits, and the Colt Patent Fire Arms Manufacturing Co. expanding operations in some of its lines. Representatives from South America, visiting Hartford recently, discussed machinery contracts.

The Wickwire-Spencer Co., of Worcester, anticipates starting its blast furnace in June. The Goss & DeLeeuw Machinery Co. will shortly be in production in its new shop addition. The Bridgeman Machine Co., which will manufacture box making machinery, will soon establish a plant in Norwich, Conn. Special machinery builders continue busy and overtime operations prevail. Small tool manufacturers report a continued good volume of sales.

MILWAUKEE

Definite signs of improvement in the general business situation are expected to bring about a betterment in the market for metal working equipment. While the volume of tool sales in the early part of April bore signs of limitations, the fact that gains have been recorded over the corresponding period of March is accepted as proof that the situation is better than it has been since the declining movement set in several months ago.

It is considered significant that employment in Milwaukee, as well as generally throughout Wisconsin, is showing gains for the first time since August, 1926, according to official figures issued by the Industrial Commission of Wisconsin. The increase became most noticeable in the latter part of March. Practically all lines of industry are sharing in the improvement. In the metal working industries as a group it is only 9.7 per cent less, which represents a significant gain over the September-February period.

Automobile factories, while presenting requirements considerably less than a year ago, are looming as more important buyers, and earlier expectations as to the year's volume from this source are gradually being exceeded. Retail sales are running above estimates in this territory.

CHICAGO

The first week of April has not developed the amount of business in machine tools that had been looked for. There have been a number of sales of single tools and small lots within the Chicago district, but apart from this show of activity business in machinery has been quiet as a whole. Railroads have been somewhat of a disappointment in the matter of submitting lists, but the feeling of optimism is general that at least within the next few weeks such roads as have not as yet indicated their needs will be heard from. Thus far in 1927 the Rock Island and Santa Fe roads have furnished the greater number of orders received from railroad interests.

Automotive production having again started to increase, a stimulus has been given to the sale of certain tools especially adapted to the needs of that industry. Used tools in first class condition are showing an increased demand, some of the railroad shops having filled their present needs with these. Prices for used machinery are being well maintained and are expected to stay at a high figure, competition notwithstanding. There are practically no new features regarding the machinery market to report at this writing; optimism that better conditions will prevail as the year advances is, however, generally expressed.

NEW YORK

Sales of machinery and machine tools in this market have shown no tendency to either increase or fall below the normal volume. Some dealers and agents report a decided slump in orders, with a corresponding lull in inquiries. Others are working feverishly on quotations that call for substantial lists of equipment. One or two purchases by railroads, and a few by manufacturers of automobiles and accessories, were received in the last week.

The list of equipment sold in the period includes a 4-spindle drum type miller to the Ford Motor Co., a steam hammer to the Texas & Pacific R.R., and a large planer and three lathes to a steel company. Manufacturers of electrical goods are looking for certain types of tools and registered orders in the past week for radial drills, automatic centering machines and a vertical surface grinder.

PHILADELPHIA

Although the last two weeks has not witnessed the closing of large orders by machinery and machine tool dealers in the Philadelphia area, leaders in the industry regard the situation as justifying a feeling of hopefulness.

Producers of heavy machine tools state that their information shows most of the principal railroads throughout the country have lists in preparation. Recent annual reports showing record rail earnings is one of the hopeful signs, and a survey reveals that most of the carriers have not the machine tool requirements to meet the increasing business.

The Philadelphia market has not found the automotive industry buying to any great extent. The Chevrolet and the Ford companies were in the market for some small purchases. There has been some buying from general industrial concerns, and most of the inquiries have a hopeful tone. Dealers report that the present situation shows an improvement over the corresponding period of last year. Plants are operating as high as 80 per cent of capacity.

Metallurgical Exhibit at Cleveland

Metallurgical equipment and materials is the specialty for the month of April at the continuous exhibit operated by the Cleveland Engineering Society in that city. This is an educational exhibit in which many of the leading manufacturers of the country are displaying their products for the information of engineers, metallurgists and industrial executives of the Cleveland district. The exhibit hall is located on the top floor of Carnegie Hall adjacent to the clubrooms of the Cleveland Engineering Society.

Among the firms that have displays at the exhibit during April are: The Bailey Meter Co., R. E. Bronson Co., Carey Co., Case Hardening Service Co., Chicago Pneumatic Tool Co., Cleveland Hardware Co., Cleveland Tool and Supply Co., Cleveland Twist Drill Co., Commercial Tool Co.

Dahlstrom Metallic Door Co., Fraser Sales Corporation, Gairing Tool Co., Gardner Tap and Die Co., Grasselli Chemical Co., Lincoln Electric Co., National Tool Co., New Haven Sand Blast Co., C. W. Poe Co., J. M. & L. A. Osborn Co.

Sandusky Cement Co., Standard Tool Co., Timken Roller Bearing Co., J. C. Ulmer Co., Warner & Swasey Co., Wellman Bronze Co., Wood & Spencer Co.

A meeting will be held in the exhibit hall under the sponsorship of the local section of the American Society for Steel Treating on April 22, with the co-operation of the Cleveland Engineering Society. A paper on "Die Blocks and Heavy Forgings," illustrated with motion pictures, will be presented at this meeting by J. A. Succop, director of research of the Hepenstall Forge and Knife Co., of Pittsburgh.

Dayton Forms Section of Steel Treaters

Dayton has organized a chapter of the American Society for Steel Treating, with an initial membership of 102 members, fourteen of which are sustaining members.

The organization committee, consisting of individuals already members of the society, under the chairmanship of H. H. Skinner, held several meetings to discuss the situation and then held the first meeting on March 31. Over 250 members and guests were in attendance at the Dayton Engineering Society's auditorium to hear Frank R. Palmer, of the Carpenter Steel Co., present his interesting lecture "Giving Tool Steels a Chance."

During the preliminary organization a charter was presented to the new chapter and the following officers were elected for the ensuing year: Chairman, G. J. Oswald, research department, National Cash Register Co.; vice-chairman, O. Z. Klopsch, engineering department, Delco-Light Co.; secretary-treasurer, F. M. Reiter, industrial engineer, Dayton Power and Light Co. Members of the executive committee are: E. C. Carter, National Cash Register Co.; H. H. Skinner, in charge of gas sales, Dayton Power and Light Co.; R. G. Rogers, foreman, heat-treating, Delco-Remy Corporation; H. M. Williams, metallurgist, Delco-Light Co.; T. J. Mullen, manager in charge of sales, City Machine and Tool Co.; C. E. Merrill, superintendent, Gustave Wiedeke Co.; and F. T. Sisco, chemist, McCook Field. The Dayton chapter has scheduled W. S. Bidle, president of the W. S. Bidle Co., Cleveland, and past president of the A.S.S.T., as the speaker for the April 18 meeting. Earl C. Smith, assistant general superintendent, the Central Alloy Steel Corporation, Canton, will be the speaker on May 23.

Official Washington Not in Accord with Kerensky

Observers in Washington have been unable to discern the strong drift of public sentiment in Russia away from the Soviet, as is reported by Alexander Kerensky. As much as they would like to be convinced otherwise, they can see no signs of a change in the situation there. They agree with Mr. Kerensky that American trade with Russia probably would be less were the existing government recognized. The administration is stoutly maintaining its policy of withholding social recognition as the only way open to it to emphasize its disapproval of the confiscation of American property, the disregard of all claims and the repudiation of debt to the United States.

A.E.S.C. Would Standardize Machine Speeds

Standardization on a national scale of the speeds of machinery is proposed by the National Electrical Manufacturers' Association in a request to the American Engineering Standards Committee to take the matter up with the purpose of simplifying and clarifying the existing situation.

In making the request the association states that under present conditions the curve of the speeds of driven machinery is practically a random distribution without any logical ordering of the values used. As a result of this, the sizes of pulleys, gears, sprockets, etc., which manufacturers have to produce, and which manufacturers, jobbers, dealers and users must keep in stock have been multiplied endlessly.

It is the view of the electrical manufacturers that the proposed standardization which should result in a relatively small number of co-ordinated speeds for the almost innumerable kinds of machinery, would afford an easy approach to the problem of simplification and standardization of pulleys, gears, sprockets, etc., and would permit much greater flexibility in the selection and use of both power units and driven machinery, greatly promoting interchangeability of such units, and providing economies for innumerable industries using such equipment.

As the first step, the American Engineering Standards Committee will convene a general conference of the principal trade associations, technical societies, and other interested groups.

Business Items

The La Salle Tool Co. announces the removal of its plant and offices to Ottawa, Ill.

S.K.F. Industries, Inc., have moved their New York offices to 40 East 34th St.

The Strom Steel Ball Co. has bought a plant at Cicero and will move there at once from River Forest, Ill.

The National Forge and Ordnance Co. is the new name of the National Forge and Tool Co., of Irvine, Pa.

The Erie Foundry Co., of Erie, Pa., has been granted a patent covering the latch mechanism used on the Erie board drop hammers.

The James Geer Co., Inc., machinery and mill supply distributor in the Carolina district, announces the removal of its offices from Forest City, N. C., to Spartanburg, S. C.

The Haskell, N. J., plant of the E. I. Du Pont de Nemours Co., was sold last week to H. B. Brainerd, of New York. The new owner will remodel the plant for manufacturing.

The Motch & Merryweather Machinery Co., of Pittsburgh, announces an exhibit of the new centerless grinder manufactured by the Cincinnati Milling Machine Co. The exhibit will last for two weeks.

The Carpenter Steel Co. is now occupying its new Detroit warehouse and office at 6215 Warren Ave., West. The new building was constructed for the special needs of the company and includes larger storage facilities and other conveniences.

The Clyde Iron Works Sales Corporation, distributor of the Clyde Iron Works products in the Florida and south Georgia territory, has removed its Jacksonville, Fla., branch from the Bisbee Bldg., to larger quarters in the Barnett National Bank Bldg., 112 W. Adams St.

The National Machine Co., of Wethersfield, Conn., has voted to liquidate. The company was taken over by the American Type Founders Co. Claims against the National Machine Co. are to be filed with Richard T. Steele, of 50 State St., Hartford, Conn., on or before July 21.

At the annual meeting of the stockholders of the Cameron & Barkley Co., of Jacksonville, Fla., machinery and mill supply dealers operating a number of Southeastern branches, Matthew B. Barkley, vice-president of the company for the past 19 years, was elected president to succeed C. Bissell Jenkins, who was elected chairman of the board of directors.

Construction of a five-story addition to the plant of the Golden Foundry and Machine Co., at Columbus, Ga., recently began. In addition to manufacturing machinery and castings the company has a department for the distribution of machinery and mill supplies, and the new addition is to be used for storage and manufacturing purposes.

The Remington-Noiseless Typewriter Co., of New York, has acquired the L. R. Roberts Typewriter Co., of Stamford, Conn. A. A. Forest, vice-president of the Remington company states that operations will be started as soon as the court approves the sale. The plant was previously operated by the old Blickensderfer Typewriter Co. The sale to the Remington interests includes building, land and machinery.

The National Trust Co., as receiver and manager of the Dominion Iron and Steel Co., Ltd., has been granted leave by the Supreme Court of Nova Scotia, to apply for the winding-up of the British Empire Steel Corporation, and the Dominion Steel Corporation, a subsidiary. Following the court's decision, counsel for the National Trust Co. stated it was the intention of the company to proceed immediately with the application for the winding-up order.

Announcement has been made by the Steel Co. of Canada, that a new mill to produce galvanized sheets will be in operation by May 1. The company has for some years been producing black and blue annealed sheets and with the opening of

the new plant will be producing galvanized sheets through every process from the ore, this being the first time in Canada that a complete process of manufacture will have been carried out on this product. A complete line of sizes and gages will be made.

Announcement is made of the incorporation of the Anglo Canadian Engineering Co., Ltd., of Toronto, Ontario, with a Dominion charter. Harry G. Jacob, of Toronto, is president and general manager; MacAulay Pope, formerly with F. H. Hopkins & Co., Ltd., Toronto, is treasurer and director. Warehouse and showroom space has been acquired at 111 Adelaide St., West, Toronto. The company will act as sales representatives for English and American manufacturers and jobbers for general engineering supplies and materials.

The Link Belt Co. has contracted for the construction of a $36,000 addition to its Ewart plant in Indianapolis. Plant extensions by the company in Indianapolis have been underway throughout the winter and only recently the company took occupancy of an addition to its Belmont Ave. plant. The latest addition to the company's two-plant outlay in Indianapolis, will be a saw-tooth type factory building, 80x180 ft. and one story high. The new building at the Belmont plant will house a department of manufacturing which the Link Belt Company intends moving to Indianapolis from its Chicago plant as soon as possible. It will be for the manufacture of belt idlers, which now are being made at Chicago.

The Stockbridge Machine Co., of Worcester, Mass., announces the reorganization of the firm, in which John W. Harrington becomes president and treasurer, and Leon J. Barrett becomes general manager. Mr. Harrington is treasurer of the Harrington & Richardson Arms Co., and president of the Heald Machine Co. Mr. Barrett is the proprietor of the Leon J. Barrett Co. No change in the location of the manufacturing plant is contemplated at present. The general offices will be moved to the plant of the Leon J. Barrett Co., on Grafton Road. Mr. Beaman, former treasurer and manager of the Stockbridge company, has retired to start a new company to manufacture the knife grinder formerly made by the Stockbridge Machine Co.

Personals

JUDGE LUCIUS F. ROBINSON has been added to the board of directors of the Colt Patent Fire Arms Manufacturing Co.

MARVIN ST. JOHN has been appointed Toronto manager of the Canadian Equipment Co., Ltd., of Montreal.

F. W. TRABOLD has been elected president of the Transue & Williams Forging Corporation, of Alliance, Ohio.

WALTER G. STANFIELD, general purchasing agent for the Dominion Iron and Steel Corporation, has resigned.

JOHN PARKER has been appointed New York sales representative for the Standard Machinery Co., of Auburn, R. I. He is located at 50 Church St.

A. ST. O. RYLEY, manager of the Montreal office of the Trussed Steel Co. of Canada, Ltd., has been appointed a director and vice-president of the company.

THOMAS A. GASS has been appointed general manager of the Canada Wire and Cable Co., to succeed H. Horsfall. Mr. Gass has been sales manager of this company for many years.

H. B. NEWELL has been elected vice-president and director of the Fawcus Machine Co., of Pittsburgh. He has been works manager of this company for several years.

R. L. HEATON, formerly advertising manager of the S. F. Bowser & Co., pump and machinery manufacturers at Fort Wayne, Ind., has been named assistant sales manager of the commercial sales department of the company. He will be first assistant to T. D. Kinsley, vice-president in charge of the commercial sales division. Announcement also is made that the company has increased its capital stock from $6,075,000 to $6,725,000, all of the increase being preferred stock.

WILLIAM D. STONE has been elected vice-president of the Maxim Silencer Co., of Hartford, Conn., makers of industrial silencers. He will be in charge of sales. Mr. Stone was recently with the International Business Machine Co.

EARL E. KNOX has been appointed sales manager of the Bury Compressor Co., of Erie, Pa. He was formerly sales representative for this company in the Pittsburgh district, serving in that territory for the past twenty years.

WADSWORTH DOSTER, formerly sales manager of the Torrington Manufacturing Co., Torrington, Conn., has been appointed assistant sales manager of cold strip machinery department of the Mackintosh-Hemphill Co., of Pittsburgh. Mr. Doster, who was manager of the Blake & Johnson Co., of Waterbury, Conn., before it was merged with the Torrington company, has had seventeen years' experience in the designing and marketing of cold strip machinery.

Calendar of Local Meetings

Society of Automotive Engineers

Cleveland Section. April 18. "Air Travel as a Practical Means of Transport," by Col. Paul Henderson, National Air Transport, Inc.

Detroit Section. April 21. General program.

Metropolitan Section. April 21. Subject: "Highways and Vehicles," by Dr. T. R. Agg, Iowa State College.

Dayton Section. April 21. Subject: "Recent Developments in Lighter-than-Air Craft," by Dr. Karl Arnstein, Goodyear Zeppelin Co.

Detroit and A.M.A. Section. April 28. Co-operative dinner. Speaker: C. F. Kettering, General Motors Corporation.

National Association of Cost Accountants

Boston Chapter. April 21. "Remington Bookkeeping Machine Demonstration," by Harold Dudley Greeley.

Buffalo Chapter. April 28. "Wage Incentives and Their Effect on Comparative Costs," by J. H. Paterson.

Chicago Chapter. April 21. "The Administrative Use of Standard Factory Costs," by B. R. Wells.

Cleveland Chapter. April 20. "Accounting in Municipal Management."

Detroit Chapter. April 28. "Cost Accounting as a Basis for Industrial Research," by E. R. Weidlein.

Erie Chapter. April 18. "Foundry Costs."

Hawaii Chapter. April 26. "Actuarial Science," by A. F. Bauman.

Hartford Chapter. April 19. "Proper Basis for Distribution of Selling Costs," by H. G. Crockett.

Kansas City Chapter. April 18. "Cost Accounting in City Affairs Under New Charter."

Los Angeles Chapter. April 19. "Employment Problems."

Milwaukee Chapter. April 21. "Depreciation," general discussion.

Pittsburgh Chapter. April 20. "By-Product Costs," by W. E. Simily.

Rochester Chapter. April 20. "Will Simplified Practice Aid Cost Accounting," by Ray M. Hudson.

St. Louis Chapter. April 19. Address by J. P. Jordon.

San Francisco Chapter. April 25. "Cost Accounting to the Banker."

Scranton Chapter. April 26. "Transportation Management," by Earl B. Moffat.

Springfield Chapter. April 20. "Statement Ratios for Credit Analysis," by Alexander Wall.

Syracuse Chapter. April 19. Plant Visitation to the Smith Premier Factory.

Twin Cities Chapter. April 19. "Waste and Its Detection," by M. A. Pocock.

Utica Chapter. April 18. "Debatable Points in Cost Accounting and Review of Year's Subjects."

Forthcoming Meetings

American Gear Manufacturers Association. Eleventh annual meeting, Hayes Hotel, Jackson, Mich., May 12 to 14. T. W. Owen, secretary, 2443 Prospect Ave., Cleveland, Ohio.

American Society for Steel Treating. Spring sectional meeting, Milwaukee, Wis., May 19 and 20. W. H. Eisenman, secretary, 4600 Prospect Ave., Cleveland, Ohio.

American Society of Mechanical Engineers. Semi-annual meeting, White Sulphur Springs, W. Va., May 23 to 26. C. E. Davies, secretary in charge of meetings, 29 West 39th St., New York.

Associated Machine Tool Dealers. Annual spring meeting at Granville, Ohio, May 25, 26 and 27. Tyler W. Carlisle, secretary, the Strong, Carlisle & Hammond Co., 1392 West Third St., Cleveland, Ohio.

National Foreign Trade Council. Fourteenth national foreign trade convention, Hotel Statler, Detroit, Mich., May 25, 26 and 27. O. K. Davis, secretary, India House, Hanover Square, New York.

Society of Industrial Engineers. Annual meeting, Hotel Stevens, Chicago, May 25, 26 and 27. George C. Dent, secretary, 608 S. Dearborn St., Chicago, Ill.

Society of Automotive Engineers. Summer meeting, French Lick Springs, Ind., May 25 to 28. C. E. Heywood, manager of meetings department, 29 W. 39th St., New York City.

American Foundrymen's Association. Annual convention, Edgewater Beach, Chicago, June 6 to 10. R. E. Kennedy, secretary, 909 W. California St., Urbana, Ill.

National Supply and Machinery Distributors' Association. Twenty-second annual convention with the **Southern Supply and Machinery Dealers' Association,** and the **American Supply and Machinery Manufacturers' Association,** on board the steamship *Noronic.* Boat leaves Detroit, Mich., June 13 and returns there June 17. George A. Fernley, secretary, 505 Arch St., Philadelphia.

Exposition of Engineering Developments. Under the auspices of the Association of Iron and Steel Electrical Engineers, in the Empire Bldg., Pittsburgh, June 13 to 18. John F. Kelly, general chairman, 705 Empire Bldg., Pittsburgh.

American Society for Testing Materials. Annual meeting at French Lick, Ind., June 20 to 24. C. L. Warwick, secretary, 1315 Spruce St., Philadelphia.

American Railway Tool Foremen's Association. Fifteenth annual meeting, Hotel Sherman, Chicago, Aug. 31, Sept. 1 and 2. G. G. Macina, secretary, 11,402 Calumet Ave., Chicago.

Machine Tool Exhibit. Seventh annual machine tool exhibition under the auspices of the New Haven Section of the American Society of Mechanical Engineers, the Department of Mechanical Engineering of Sheffield Scientific School, Yale University, and the Chamber of Commerce of New Haven: At the Mason Laboratory, Yale University, Sept. 6 to 9. Harry R. Westcott, chairman of the exhibit committee, 400 Temple St., New Haven, Conn.

American Society for Steel Treating. Ninth annual convention and national steel exposition, Detroit, week of Sept. 19. W. H. Eisenman, secretary, 4600 Prospect Ave., Cleveland.

Machine Tool Builders' Exposition. First annual machine tool exposition, conducted by the National Machine Tool Builders' Association, at the West Annex of the Public Auditorium, Cleveland, Ohio, Sept. 19 to 24. J. Wallace Carrel, vice-president and general manager, the Lodge & Shipley Machine Tool Co., Cincinnati, chairman of the exposition committee. Roberts Everett, manager of the exposition, 225 West 34th St., New York. Ernest F. DuBrul, general manager of the association, 826 Provident Bank Bldg., Cincinnati, Ohio.

The Weekly Price Guide

Rise and Fall of the Market

A CERTAIN amount of weakness persists in prices of steel materials, particularly black and galvanized sheets. Demand is improving for structurals, tank plates and agricultural implement stock, with prices firmer. The market for railway and automotive material and pipe displays no particular signs of activity. The quotation of $1.90 per 100 lb. holds at Pittsburgh mills on the three principal hot-rolled steel products, with slight cutting under on plates and shapes.

(All prices as of Apr. 8)

IRON AND STEEL

PIG IRON—Per gross ton, f.o.b.:

CINCINNATI	
No. 2 Southern	$22.19
Northern Basic	20.89
Southern Ohio No. 2	21.19
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	26.37
BIRMINGHAM	
No. 2 Foundry	18.50
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	22.76
Virginia No. 2	27 17
Basic	21.76
CHICAGO	
No. 2 Foundry local	21.00
No. 2 Foundry, Southern (silicon 2.25@2.75)	23.55
PITTSBURGH, including freight charge ($1.76) from Valley	
No. 2 Foundry	20.26
Basic	19.76
Bessemer	21.26

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	4.00@4.50
Cleveland	5.00@5.25
Cincinnati	5.00@5.50
New York	5.25@5.50
Chicago	4.75@5.25

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the mill base in large lots.

Blue Annealed	Pittsburgh Mill Base	Chicago	Cleveland	New York
No. 10	2.15@2.25	3.50	3.25	3.89
No. 12	2.20@2.30	3.55	3.30	3.94
No. 14	2.25@2.35	3.60	3.35	3.99
No. 16	2.@352.45	3.70	3.45	4.09
Black				
Nos. 18 to 20	2.60@2.70	3.75	3.25	4 00
No. 22	2.75@2.85	3.90	3.40	4 15
No. 24	2.80@2.90	3.95	3.45	4 20
No. 26	2.90@3 00	4.05	3.55	4.30
No. 28	3.05@3.15	4 20	4.70	4.45
Galvanized				
No. 10	2.95@3.05	4.10	3.95	4.25
Nos. 12 to 14	3.05@3.15	4.20	4.05	4 35
No. 16	3.15@3.25	4.30	4.15	4.45
No. 18	3.30@3.40	4.45	4.30	4.60
No. 20	3.45@3.55	4.60	4.45	4.75
No. 22	3.50@3.60	4.65	4.50	4.80
No. 24	3.65@3.75	4.80	4.65	4.95
No. 26	3.85@3.95	5.05	4.90	5.20
No. 28	4.10@4.20	5.30	5.15	5.45

WELDED STEEL PIPE—Warehouse discounts are as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded	53%	39%	55½%	43½%	54%	41%
2½ to 6 in. steel lap welded	48%	35%	53½%	40½%	51%	38%

Malleable fittings: Classes B and C, banded, from New York stock sell at list plus 4% less 5%. Cast iron, standard sizes, 36-5% off.

Size, Inches	List Price per Foot	Diameter in Inches — External	Diameter in Inches — Internal	Thickness Inches
1	$0.17	1.315	1.049	.133
1¼	.23	1.66	1.38	.14
1½	.27½	1.9	1.61	.145
2	.37	2.375	2.067	.154
2½	.58½	2.875	2.469	.203
3	.76½	3.5	3.068	.216
3½	.92	4.0	3.548	.226
4	1.09	4.5	4.026	.237
4½	1.27	5.0	4.506	.247
5	1.48	5.563	5.047	.258
6	1.92	6.625	6.065	.28

SEAMLESS STEEL TUBING—Following net prices are for seamless mechanical tubing, cold drawn, round, .10 to .30 carbon, at warehouse in lots of less than 100 ft.:

Thickness — Decimal	B.W.G. and Fractions	Outside Diameter in Inches — ¼	⅜	½	⅝	1	1¼	1½
		Price per Foot						
.035"	20	$0.15	$0.16	$0.17	$0.18	$0.19	$0.21	$0.23
.049"	18	.17	.18	.19	.20	.21	.23	.25
.065"	16	.19	.20	.21	.22	.23	.25	.27
.083"	14	.20	.22	.23	.24	.25	.27	.29
.095"	13	.21	.23	.25	.26	.27	.29	.31
.109"	12	.22	.24	.26	.27	.28	.30	.32
.120" or .125"	11	.23	.25	.27	.28	.29	.31	.33
.134"	10	.24	.26	.28	.29	.30	.32	.34

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Spring steel (light) (base)*	4.50	6.00@7.50	4.65
Spring steel (heavier)	4.00	....	4.00
Coppered Bessemer rods (base)	6.05	6.00	6.20
Hoop steel	4.49	3.65	4.15
Cold rolled strip steel	6.25	6.35	6.25
Floor plates	5.25	5.30	5.00
Cold drawn shafting or screw	4.00	3.90	3.60
Cold drawn flats, squares	4.50	4.40	4.10
Structural shapes (base)	3.34	3.10	3.10
Soft steel bars (base)	3.24	3.00	3.00
Soft steel bar shapes (base)	3.24	3.00	3.00
Soft steel bands (base)	3.99	3.20	3.65
Tank plates (base)	3.34	3.20	3.10
Bar iron (2.75 at mill)	3.24	3.21	3.00
Drill rod (from list)	60%	55%	50%

Electric welding wire, New York, 1/32, 8.35c.; ⅛, 7.85c.; 5/32 to ½, 7.35c. per lb. *Flat, 1/16@¼-in. thick.

METALS

Current Prices in Cents Per Pound

Copper, electrolytic, up to carlots, New York			14.37½
Tin, pigs, 5-ton lots, New York			71.12½
Lead, pigs, up to carlots, E. St. Louis	7.00	New York	7 87½
Zinc, slabs, up to carlots, E. St. Louis	6.50	New York	7.50

	New York	Cleveland	Chicago
Antimony, slabs, ton spot	15.50	18.50	16.25
Copper sheets, base	22.00	22.00	22.00
Copper wire, base	18.87½	18.87½	15.37½
Copper bars, base	21.62½	21.62½	21.62½
Copper tubing, base	24.00	24.00	24 00
Brass sheets, high, base	18.37½	18.37½	18.37½
Brass tubing, high, base	23.25	23.25	22.75
Brass rods, high, base	16.12½	16.12½	16.12½
Brass wire, high, base	18.87½	18.87½	18.87½

Shop Materials and Supplies

METALS—Continued

	New York	Cleveland	Chicago
Aluminium ingots, 98 to 99%, 1 to 15 ton lots	26.00	26@27	26.02
Zinc sheets (casks)	13.00	12.30	11.36
Solder (½ and ½), (case lots)	42.00	43.75	38½@42½

Babbitt metal, delivered, New York, cents per lb.:

Genuine, highest grade	87.00
Commercial genuine, intermediate grade	61.00
Anti-friction metal, general service	31.50
No. 4 babbitt (f.o.b.)	13.50

Nickel, f.o.b. refinery, cents per lb.:

Ingots	35.00	Electrolytic	39.00
Shot			36.00

SPECIAL NICKEL AND ALLOYS—Price in cents per lb., f.o.b. Huntington, W. Va.:

Hot rolled nickel sheet (base)	52.00
Cold rolled nickel sheet (base)	60.00
Hot rolled rods, Grade "A" (base)	50.00
Cold drawn rods, Grade "A" (base)	58.00

Base price of Monel metal in cents per lb., f.o.b. Huntington, W. Va.:

Shot	32.00	Hot rolled rods (base)	35.00
Blocks	32.00	Cold drawn rods (base)	43.00
Cold rolled sheets (base)	50.00	Hot rolled sheets (base)	42.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Crucible heavy copper	11.50 @11.75	10.75	10.75@11.25
Copper, heavy, and wire	10.75 @11.25	11.00	9.75@10.25
Copper, light, and bottoms	9.25 @ 9.75	9.50	8.75@ 9.25
Heavy lead	6.25 @ 6.50	6.25	6.00@ 6.50
Tea lead	4.75 @ 5.00	4.25	4.75@ 5.25
Brass, heavy, yellow	7.12½@ 7.37½	7.50	6.75@ 7.25
Brass, heavy, red	9.25 @ 9.50	9.50	9.00@ 9.50
Brass, light	5.50 @ 6.00	6.00	6.00@ 6.50
No. 1 yellow rod turnings	7.50 @ 8.00	7.50	7.00@ 7.50
Zinc	4.25 @ 4.50	4.00	3.25@ 3.75

TIN PLATES—Charcoal—Bright—Per box.

		New York	Cleveland	Chicago
"AAA" Grade:				
IC,	14x20	$12.10	$11.95	$11.50
"A" Grade:				
IC,	14x20	9.70	9.90	9.50
	Coke Plates—Primes—Per box			
100-lb.,	14x20	6.45	6.10	7.00
	Terne Plates—Small lots, 8-lb. Coating—Per box			
IC,	14x20	7.75@8.00	7.00	7.50

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.10@0.13½	$0.16	$0.15@0.20
Cotton waste, colored, per lb.	.09@ .13	.12	.12@.17
Wiping cloths, washed white, per lb	.17½	36.00 per M	.15
Sal soda, per lb	.02½	.02	.02¾
Roll sulphur, per lb	.04	.03½	.04
Linseed oil, raw, per 7½-lb. gal., 5 bbl. lots	.83¼	.93	.83
Lard cutting oil, 25% lard, in 5 gal. cans, per gal.	.55	.50	.50
Machine oil, medium-bodied (55 gal. metal bbl.), per gal.	.33	.35	.29
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, 24c. per lin. ft per inch of width for single ply.			
Medium grade	40–5%	40–5%	40–5%
Heavy grade	30–10%	30–10%	30–10%
Rubber transmission, 6-in., 6 ply, $1.83 per lin. ft.			
First grade	50%	50–10%	50%
Second grade	50–10%	60–5%	50–10%

Comparative Warehouse Prices

New York	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars	per lb.	$0.0324	$0.0324	$0.0324
Cold drawn shafting	per lb.	.04	.04	.04
Brass rods	per lb.	.1612½	.1612½	.1662½
Solder (½ and ½)	per lb.	.42	.425	.4012½
Cotton waste, white	per lb.	.10@13½	.13@.17½	.13@.17½
Emery disks, cloth, No. 1, 6 in. dia.	per 100	3.10	3.10	3.55
Lard cutting oil	per gal.	.55	.55	.55
Machine oil	per gal.	33	.33	35
Belting, leather, medium	off list	40–5%	40–5%	40–5%
Machine bolts, up to 1x30 in.	off list	50%*	40%	40%

*New list April 1, 1927.

MISCELLANEOUS—Continued

	New York	Cleveland	Chicago
Abrasive materials—In sheets 9x11 in., No. 1 grade, per ream of 480 sheets:			
Flint paper	$5.13*	$4.95	$5.13
Emery paper	10.71*	9.15	10.71
Emery cloth	27.84*	27.85	27.84
Emery disks, 6 in. dia., No. 1 grade, per 100:			
Paper	1.29	1.27	1.32
Cloth	3.10	3.05	3.05
Fire clay, per 100 lb. bag		.75	.75
Coke, prompt furnace, per net ton		Connellsville,	3.25@3.50
Coke, prompt foundry, per net ton		Connellsville,	4.25@4.75
White lead, dry or in oil,	100 lb. kegs	New York,	15.25
Red lead, dry	100 lb. kegs	New York,	15.25
Red lead, in oil	100 lb. kegs	New York,	16.75

*4½ reams and under.

SHOP SUPPLIES

Discounts from new list dated Apr. 1, 1927, applying on immediate deliveries from warehouse stocks in New York and vicinity:

	Broken Kegs or Cases	Full Kegs or Cases
Machine bolts, square heads and nuts:		
Up to ¾ x 6-in.	50%	50–10%
Larger up to 1 x 30-in.	45%	50%
1⅛ and 1¼ in. dia.	30%	35%
Carriage bolts:		
Up to ½ x 6-in.	50–10%	.....
Larger sizes	50%	.....
Coach and lag screws:		
Up to ½ x 6-in.	50–10%	.....
Larger sizes	50%	.....
Tap bolts, hexagonal heads	45%	.....
Nuts:		
Hot pressed, square and hexagonal, blank or tapped	45%	50–10%
Cold punched, square and hexagonal, blank or tapped	45%	50–10%
Semi-finished, hexagonal, tapped, in packages	40%	.....
Case hardened, hexagonal, tapped, in packages	30%	.....
Washers: Deduct from list, per 100 lb.	$1.50	$3.50
Rivets, button and cone head:		
Small, including 7/16-in. dia.	.....	50–10%
Large (base) per 100 lb.	$6.50	$5.00

EXTRA per 100 lb. on rivets, for ½-in. dia., 35c.; ⅝-in., 15c.; 1-in., 5c.; lengths 1 in. and shorter, 25c.; longer than 1-in. up to and including 1 ¼-in., 15c.; longer than 5-in., 25c.; standard countersunk head, 25c.

Machine Requirements and Industrial Construction

Equipment Wanted

Ill., Streator—The Anthony Co.—squaring or splitting gap shear, ½ to ¾ in. plate capacity.

Mass., Boston — P. O. Box 1681—bench saw and bench drill.

Mass., Brookline (Boston P. O.)—P. O. Box 73—machinery and equipment for proposed new machine shop.

N. Y., Clayton—Carl. H. Frink—Chicago power bending brake, 12 ft. x ¼ in. capacity.

O., Akron—Firestone Tire & Rubber Co.—turret lathe.

O., Akron—City, A. S. Helpbringer, Purch. Agt., will receive bids until Apr. 22 for a full revolving light crane, caterpillar traction, 45 hp. gasoline motor, 100 ft. per min. under own power, capable of handling 3 ton load, 15 ft. radius or 1½ ton load 25 ft. radius, 28 to 35 ft. boom.

O., Youngstown—Commercial Shearing & Stamping Co., 1775 Logan Ave.—10 ton 37 ft. span electric overhead crane.

Pa., East Pittsburgh—Westinghouse Electric & Mfg. Co.—12 sensitive drills, 2 milling machines, 2 lathes and additional small tools (2nd quarterly list).

Pa., Pittsburgh—Pittsburgh & Lake Erie R.R. Co., C. M. Yohe, Purch. Agt.—one 40 ton and one 7½ ton cranes.

Wis., Milwaukee—Bd. of School Directors, 325 10th St., F. Harboch, Secy., will receive bids until Apr. 18 for rip saws, shapers, sanders, cut-off saw star benches, planers, band saw blazer and filing knives.

Opportunities for Future Business

Calif., Oakland — General Electric Co., 5441 East 14th St., awarded contract for the construction of addition to plant on East 14th St. Estimated cost $150,000.

Conn., Bridgeport—E. Lambert, 50 Milne St., plans the construction of a garage at 1027 Fairfield Ave. Estimated cost $150,000. Cadillac Co., 532 Fairfield Ave., lessee.

Conn., Torrington—Torrington Motor Co., South Main St., awarded contract for the construction of a 2 story, 64 x 160 ft. repair and service garage. Estimated cost $75,000.

Ill., Silvis — Chicago, Rock Island & Pacific Ry. Co., La Salle St. Station, Chicago, will soon award contract for the construction of a 1 story locomotive repair shop here. Estimated cost $134,000. C. A. Morse, Ch. Engr.

Ill., Chicago — Hills-McCanna Co., 2025 Elston Ave., manufacturers of force feed lubricators, is having plans prepared for the construction of a 1 story, 60 x 200 ft. factory. Estimated cost $40,000. Frank Chase Inc., 720 North Michigan Ave., Archt.

Ind., Anderson—American Steel Wire Co., H. O'Connor, Supt., 16th and Locust Sts., plans the construction of a new fence plant and electric welding fabric mill. Estimated cost $1,000,000.

Mass., Brighton (Boston P. O.) — Scott Bros. Inc., 1-5 Emery Rd., awarded contract for the construction of a 1 story, 75 x 100 ft. garage and repair shop. Estimated cost $40,000.

Mass., Dalton — Byron Webster Co., awarded contract for the construction of a 1 story machine shop. Estimated cost $50,000.

Mass., Holyoke—Worthington Pump & Machinery Corp., had plans prepared for extensions and improvements to Deane works including 60 x 150 ft. machine shop, etc. Estimated cost to exceed $200,000.

Mass., Lynn — G. Mendelsohn, Grossman Bldg., awarded contract for the construction of a 1 story, 100 x 175 ft. repair and service garage on Union St. Estimated cost $50,000. Noted Jan. 6.

Mass., Newburyport—Beacon Oil Co., 30 Beacham St., Everett, awarded contract for the construction of a 1 story garage and repair shop on Bridge Rd., here. Estimated cost $40,000.

Mich., Detroit — Argonaut Realty Co., awarded contract for the construction of a 186 x 200 ft. sales and service building.

Mich., Detroit—Buick Motor Car Corp., General Motors Bldg., awarded contract for the construction of a 3 story, sales and service station at Cass Ave. and Amsterdam St.

Mich., Detroit—Chrysler Corp., Highland Park, awarded contract for the construction o. a 108 x 190 ft. factory here.

Mich., Detroit—Hupp Motor Car Corp., 3461 East Milwaukee St., awarded contract for the construction of a 74 x 300 ft. sales and service building.

Mo., Kansas City — Schutte Investment Co., will soon award contract for the construction of a 1 story, 115 x 178 ft. garage and service station at 15th St. and Kansas Ave. Estimated cost $75,000. M. R. Sannerman, 519 Lee Bldg., Archt. This corrects report noted under St. Louis, Mo. in the Mar. 31 issue.

Mo., St. Louis—Associated Motor Terminal Co., c/o W. King & Associates, Inc., Planters Bldg., is having preliminary plans prepared for the construction of a 6 story, 81 x 127 ft. garage at Seventh and Morgan Sts.

Mo., St. Louis — General Electric Co., River Rd., Schnectady, N. Y., is receiving bids for the construction of first unit of electric manufacturing plant at Bircher and Goodfellow Aves., here. Private plans.

N. H., Nashua — City, P. D. Sargent, Mayor, will soon award contract for the construction of a 1 story, 60 x 200 and 55 x 60 ft. machine shop and garage at East Hollis and Dearborn Sts. S. Belanger & Son, 308 Main St., Archts. Noted Apr. 7.

Mo., St. Louis — Universal Automobile Service Co., c/o C. R. Felton, Pres., Missouri Theatre Bldg., plans the construction of a 6 story, 150 x 150 ft. garage at Dalmar and Grand Sts. Estimated cost $700,000. Pleitch & Price, 1592 Arcade Bldg., Archts.

N. J., Elizabeth—Lidgerwood Mfg. Co., awarded contract for the construction of a 116 x 600 ft. machine shop, etc. Estimated cost $500,000. Noted Apr. 7.

N. Y., Rochester—Vogt Mfg. Co., 408 St. Paul St., manufacturers of casket and carriage trimmings, is having plans prepared for the construction of a 1 story, 320 x 360 ft. factory on Fernwood St. Estimated cost $275,000. G. M. Wolfe, 1377 Main St., Archt. and Engr.

O., Canton—Central Alloy Steel Corp., plans the construction of an electric mill. Estimated cost $850,000.

O., Cleveland—The John Harsch Bronze & Foundry Co., H. R. Harsch, Treas. and Gen. Mgr., 11612 Madison Ave., awarded contract for the construction of a 2 story, 60 x 70 ft. addition to factory. Estimated cost $40,000. Noted Mar. 31.

O., Cleveland—The Smith Incubator Co., W. A. Smith, Treas., 1920 West 77th St., is having plans prepared for the construction of a 1 story, 200 x 200 ft. factory. Estimated cost $150,000. Private plans.

O., Cleveland—The Wood & Spencer Co., F. W. Wood, Pres., 1930 East 61st St., nut and tap manufacturers, awarded contract for the construction of a 1 story, 85 x 150 ft. factory at East 61st St. and Curtis Ave. Estimated cost $80,000. Noted Mar. 31.

O., Dayton—H. G. Carneel, N. Cimons, et al, plan the construction of a 99 x 198 ft. garage at 27-33 North Jefferson St. Estimated cost $300,000. Schenck & Williams, Third National Bank Bldg., Archts.

O., Newcomerstown — Leech Motor Co., awarded contract for the construction of a 1 story, 48 x 120 ft. garage on South River St. Estimated cost $40,000.

Okla., Bartlesville—Bartlesville Zinc Co., plans to remodel and improve zinc plant. Estimated cost $35,000. Private plans.

Okla., Tulsa—Frick Reid Supply Co., 16 South Main St., manufacturers of oil and gas supplies, awarded contract for the construction of a 2 story, 60 x 100 ft. plant. Estimated cost $53,760. Noted Jan. 27.

Okla., Tulsa—W. O. Morrow, J. E. Washington and K. F. Connor, awarded contract for the construction of a 4 story, 100 x 140 ft. garage at 313 South Cincinnati St. Estimated cost $145,146.

Pa., Carnegie—Pittsburgh & West Virginia Ry., Wabash Bldg., Pittsburgh, awarded contract for the construction of 1 story shops here. Estimated cost $150,000. H. H. Temple, Ch. Engr.

Pa., Chester—Philadelphia Interurban Gas & Electric Co., 712 Locust St., Philadelphia, plans the construction of a 1 story, 60 x 140 ft. garage and repair shop at Second and Welsh Sts.

Pa., Philadelphia — Neel Cadilac Co., Broad and Ridge Sts., will soon award contract for the construction of an 8 story, 75 x 160 ft. sales and service station. P. S. Tyre, 114 South 15th St., Archt.

Pa., Philadelphia—Philadelphia Hardware Malleable Iron Works, Inc., Ninth and Jefferson Sts., plans the construction of a 1 story, 60 x 140 ft. forge shop, etc. at State Rd. and Rahn Sts. William Steele & Son, 15th and Cherry Sts., Engrs.

Pa., Rook (mail Pittsburgh)—Pittsburgh & West Virginia Ry. Co., 417 Wabash Bldg., Pittsburgh, awarded contract for the construction of a machine shop here. Estimated cost $150,000. H. H. Temple, Ch. Engr.

Wis., Kewaskum—Kewaskum Aluminum Co., A. L. Rosenheimer, Pres., is having plans prepared for the construction of a 2 story, 50 x 80 ft. factory. Estimated cost $40,000. Private plans.

Wis., Madison—The Keeb Co., J. A. Markward, Mgr., 328 West Gorham St., is receiving bids for the construction of a 1 story, 55 x 66 ft. service station and shop. Estimated cost $55,000. Law, Law & Potter, First Central Bldg., Archts.

Wis., Richland Center — Southwestern Veneer & Box Co., A. C. Burnham, Pres., is receiving bids for the construction of a 1 story, 100 x 140 ft. factory. Estimated cost $40,000. Private plans. Noted Mar. 31.

Wis., Sheboygan—F. V. Cooper & Son, 2330 South 7th St., awarded contract for the construction of a 1 story, 60 x 75 ft. shop and service station on 8th St. Estimated cost $40,000.

Wis., Sheboygan—Sheboygan Motor Co., 1215 North 9th St., is receiving bids for the construction of a 1 story, 60 x 100 ft. repair shop and service station on Erie St. Estimated cost $40,000. H. P. Satre, 319 Park Ave., Archt.